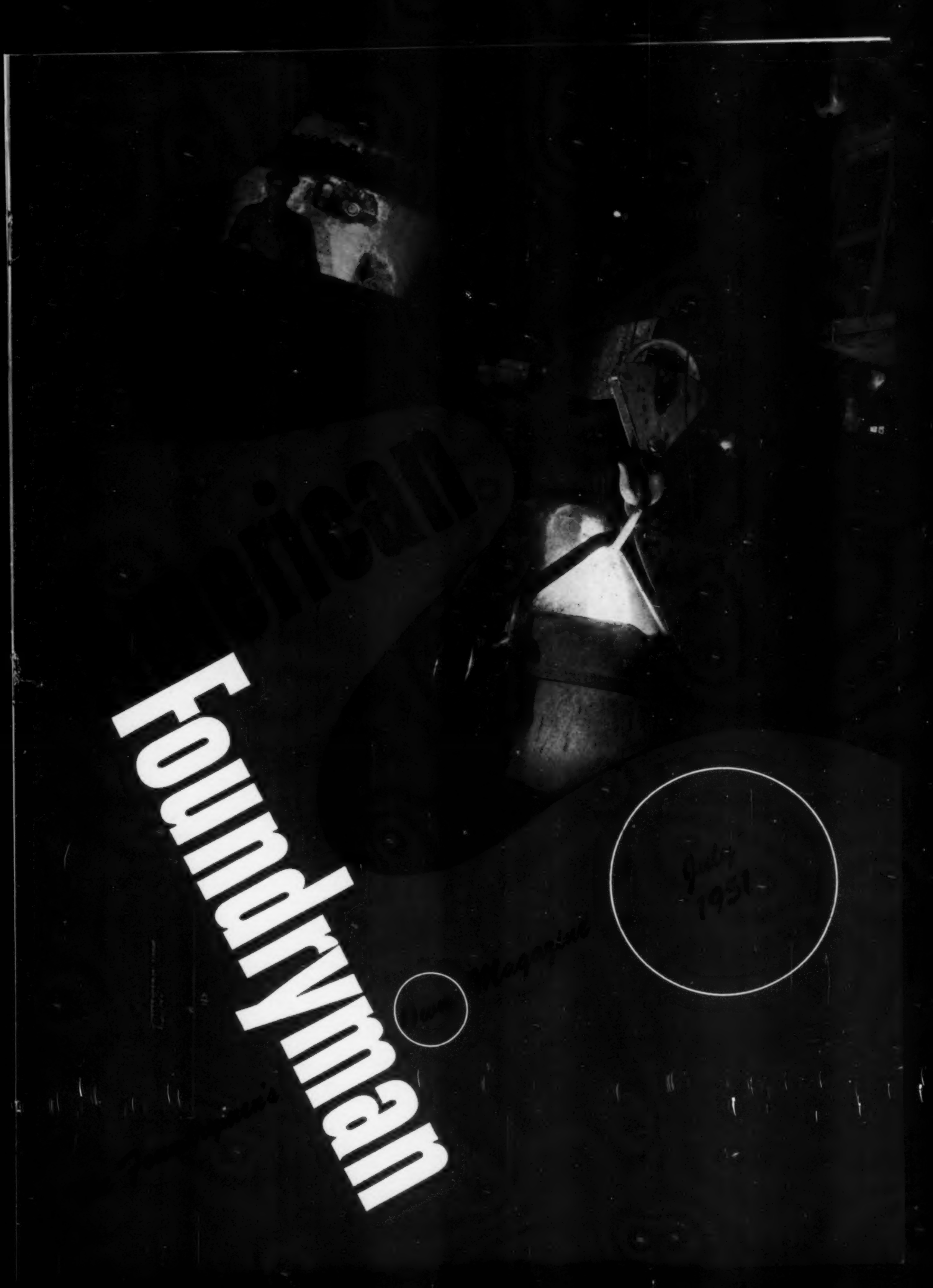
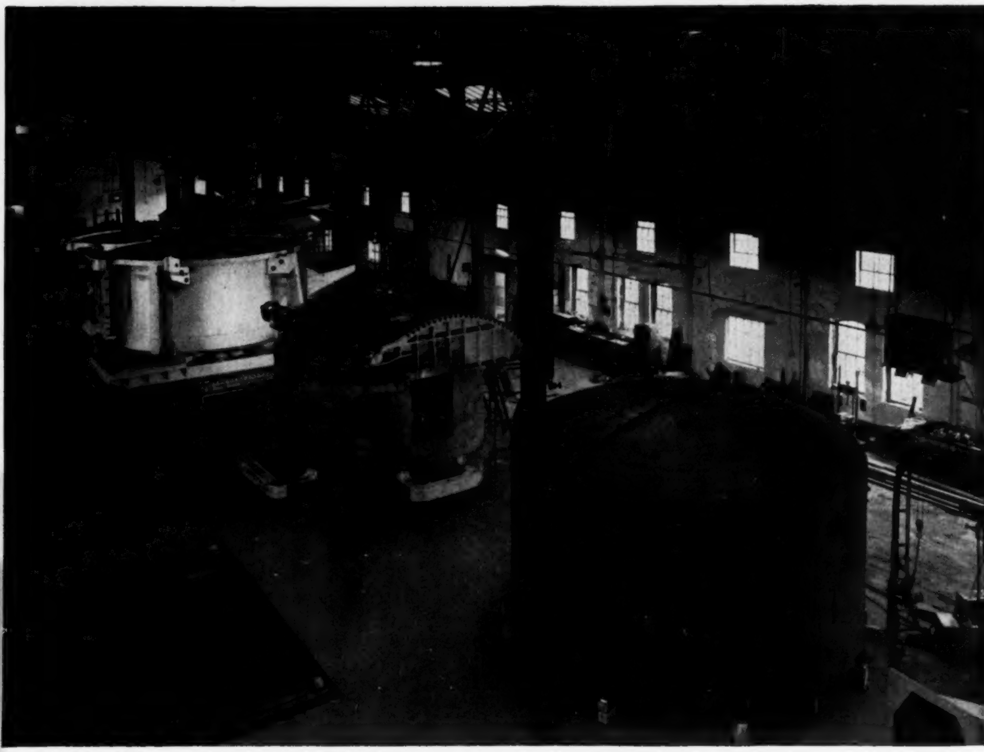

foundryman
July 1951



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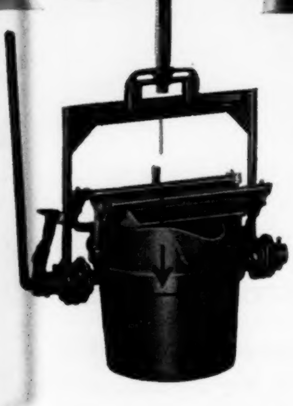

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VOLUME XX, NUMBER 1

July, 1951

American Foundryman

Official publication of American Foundrymen's Society

Iron at the Bond Plant, American Radiator & Standard Sanitary Corp., Buffalo, N. Y., is melted in externally-fired hot blast cupolas at a rate of 17 tons per hour. Two cupolas operate for two shifts on alternate days. Tapping is continuous, slag coming out at the front to be sluiced into a settling basin which is emptied as required by a yard crane and bucket. The ingenious crane hook enables the operator to pick up and release ladles without the assistance of a man on the floor.

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Bison Castings, Inc., Buffalo, N. Y., cast this hydraulic jack cylinder in ductile iron for strength and pressure-tightness. Note, at right and left, sections cut from castings to show soundness.

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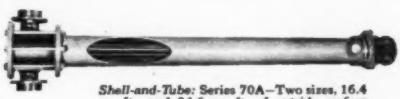

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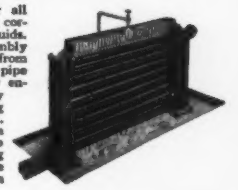

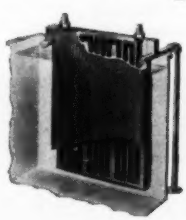

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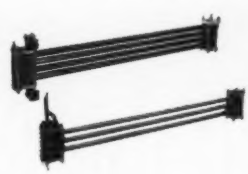

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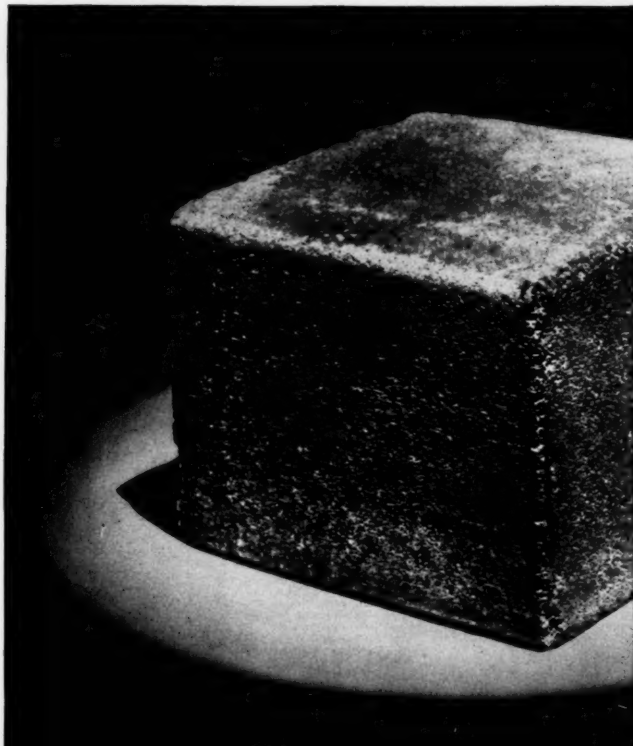

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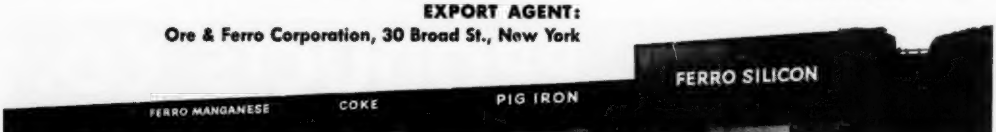
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BEATRICE, NEBRASKA

May 15, 1951.

National Engineering Company,
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Before installation of the Simpson Intensive Mixer we were forced to reject sand currently as it would become unfit for use in making good castings. The sand used for facing in all molds is delivered properly conditioned to the molding floors. As additional sand is taken from the heaps from day to day, the condition of the entire heap is thus kept at a high standard and rejection of sand has practically ceased. Maintaining sand in uniform condition promotes good castings day after day. This has contributed to our reduction in casting scrap.

Another factor which we consider of great importance is the surface quality of our castings. We realize that uniform quality of sand is necessary to accomplish this result and the Simpson Intensive Mixer has contributed greatly to this improvement.

Taking everything into account, we are well pleased with the operation of this equipment.

Very truly yours,
DEMPSTER MILL MANUFACTURING COMPANY.

Clyde B. Dempster.
PRESIDENT.

CBD:AW

WHAT'S WRONG WITH THE FOUNDRY?

WHAT'S WRONG with the Foundry? Nothing—with the good shops. Many progressive shops have proudly represented the Foundry Industry in their communities for years. They have had good operations in the past and are looking ahead to greater improvement in product, process, and personnel in the future.

A vast industry made up of many units which require a variety of skills, the Foundry includes a number that are progressive, some that are not. Like one rotten apple in a barrel, one poor shop can spoil the reputation of the Foundry Industry in a community and among many customers. The Foundry must not only promote the best that it is and does, but must also educate and persuade the poorer shops to improve facilities . . . to acquire better men . . . and to make better castings.

Work in a good foundry is regarded in any community as respectable, creative, and full of opportunities for young men with varying combinations of manual skills, engineering training, business acumen, and personality. Such a foundry has already sold itself as a good place in which to work, and should continue to do so through adoption of progressive ideas and a program for maintaining good community relations.

Such a foundry offers ample evidence that few industries provide so much opportunity for ingenuity and creative work. It shows why converting molten metal into a casting of intricate design has always held such fascination for all who work in the Foundry. And why no other fabricating method can compete economically with the foundry process in making complicated shapes.

The plants which make up the Foundry Industry range from small shops, with less than a dozen workers, to the large production foundries, producing hundreds of tons of castings a day and employing thousands of people. In this industry the small, progressive shop and the giant establishment are equally important in supplying castings. In each foundry there are problems of melting and molding, materials handling, selection of materials for molds and metals for castings, economics, and problems of working with others in the plant. This versatile, challenging industry need never become boring to worker, to technicians, or to management.

What's the matter with the Foundry? Much of the answer depends on the personnel running the shops. Some shops are well-managed and are full of opportunities for their employees; others are poorly operated and offer little in good castings or in opportunities for the workers. Good management calls for, along with many other considerations, injecting new blood into the industry. Many young men from high schools, trade schools, and colleges have become interested in the Foundry as a career, yet relatively few foundries have taken advantage of this in bringing these men into the plants.

The services of these young men must be solicited in competition with other great industries by selling ourselves, our companies, and our industry. Good shops need not fear competition of other industries because the foundries have more to offer to promising young men. But they must go out after their men. Today it is not possible to sit back and wait for the men to come to the foundry—the foundry must go to the men.

No apologies need be offered for anything in a well run foundry. It is up to those foundries which are progressive to tell the world about the Foundry Industry. Those that cannot do this convincingly are in danger of falling rapidly behind in the parade of this great industry. Their life expectancy is comparatively short.

What's wrong with the Foundry? Nothing that pride and vision cannot overcome. Let us be proud of the good shops, for they represent the modern Foundry Industry—and there is nothing the matter with that! Let us urge the poor shops to bring themselves up for their own benefit and the benefit of our Industry.

Frederick G. Sefing.

FREDERICK G. SEFING
NATIONAL DIRECTOR
AMERICAN FOUNDRYMEN'S SOCIETY

National Director F. G. Sefing, research metallurgist, International Nickel Co., New York, has for many years been instrumental in furthering the cause of better foundry education and training. As first chairman of the A.F.S. Educational Division and as head of one of its predecessors, the Committee on Cooperation with Engineering Schools, he has influenced many young men to enter the foundry field. Holder of a B.S. in metallurgical engineering from Lehigh University (1919) and an M.S. from Pennsylvania State College (1924), his career has included work in both education and industry. He is a past chairman of the Metropolitan Chapter and was for several years one of the trustees of the Foundry Educational Foundation.

heat transfer

—the invisible foundry tool

Victor Paschkis
Technical Director
Heat and Mass Flow Analyzer Laboratory
Columbia University
New York

The average foundryman is so accustomed to working with heat he is hardly aware of the thermal laws with which he deals. The impressions of a non-foundryman heat transfer specialist regarding foundry thermal practice are presented in this article, excerpted from the official A.F.S. Exchange Paper, "Some Thermal Considerations in Foundry Work," presented at the 48th Annual Meeting of the Institute of British Foundrymen at Newcastle-on-Tyne this June. The author conducts the A.F.S. Heat Transfer Research Project at Columbia University.

Thermal problems are more widespread in the foundry than might be commonly expected. For example, in the flow diagram of a foundry using sand molds shown below (Fig. 1), more than a third of all operations are based at least in part on thermal considerations. One important item is omitted from the diagram—the design of a casting.

Thermal considerations should definitely enter into the design of a casting, although in many instances even the designer is not aware of this. Often phases of foundry production that present heat flow problems are not recognized. Though much work has been done in recent years on thermal aspects of solidification, it would be well for the foundryman to review all casting processes affected by thermal considerations.

Design. Differences in solidification times of sections of varying thicknesses and shapes, limits of thickness which can be cast, and stresses resulting from differences in solidification cooling pattern are the thermal considerations here.

Melting. The two predominant types of melting equipment are the cupola and the arc furnace, and for producing malleable iron, the air furnace. Of these types, the cupola is the least expensive means of melting, but even here costs can be reduced by utilizing waste heat for preheating of air, charge, and fuel. Factors influencing the selection of cupola wall thicknesses include: (1) mechanical strength of the cupola, (2) refractory life, which is governed partially by inside surface temperature and by the steepness of the temperature gradient in the wall, and (3) heat losses through the lining. These last two items are essentially thermal problems, as is selection of the size of pieces of the charge and coke. Adequate means of temperature measurement in the cupola will do much to offset costly foundry errors.

In selecting electrode sizes for arc furnaces, such factors as spacing of electrodes, length of arc, insulation of lining, and electric-connected load (rate of power input) are thermal problems and affect furnace operation and economy.

Core type induction furnaces, used for melting in brass and aluminum foundries, frequently operate only during one or two shifts and since it is not practical to shut them down for the balance of the 24-hour workday, are idle for one or two shifts, making the heat loss problem an important one.

Ladles. Thickness of ladle lining, degree of preheating of lining, time of holding and/or emptying, time between emptying and refilling, all influence the tem-

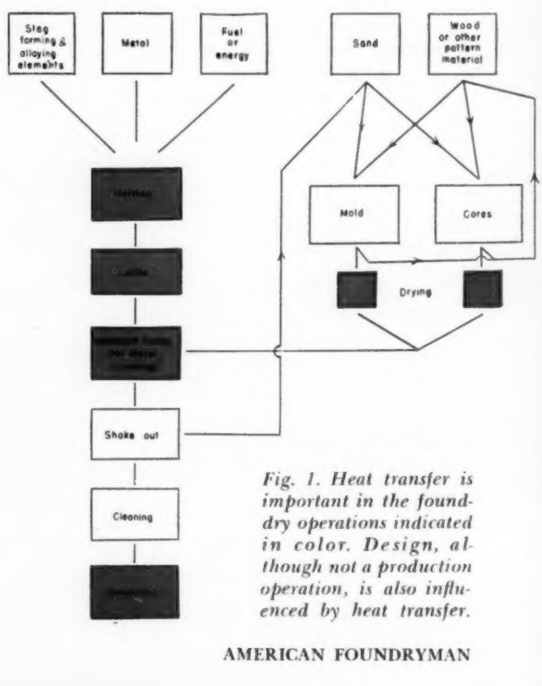


Fig. 1. Heat transfer is important in the foundry operations indicated in color. Design, although not a production operation, is also influenced by heat transfer.

perature at which the metal is poured. With today's knowledge of heat transfer, this influence can be expressed in reasonably accurate terms—the smaller the ratio of thermal conductivity to the volumetric specific heat of the lining, the smaller the temperature drop.

Casting. Sound castings can be expected only if the flow of liquid metal and the flow of heat are coordinated. Since metal can flow only as long as it is liquid, the solidification times of the metal as it flows through the gate, sprues and runners and fills the casting and risers are of utmost importance. As metal freezes along these paths it decreases the available feeding area for liquid metal, interacting directly with problems of liquid flow. Small wonder that this phase of foundry receives most attention from a thermal point of view.

Drying of Molds and Cores. Drying of cores and molds consists of raising their temperature so that either oxidation takes place, as in the case of oil binders, increasing greatly with the temperature obtained, or vapor pressure (water) is increased to drive vapor through interstices between sand grains.

It is known that an attempt to dry too rapidly will result in a hardened shell, preventing the moisture at some distance from the surface from escaping. The result is a spoiled mold or core. Qualitatively, the foundryman is aware of these conditions, but he probably does not know that heat transfer is advanced enough to give some quantitative answers to the problems involved.

Dielectric baking of cores has proved quite successful in recent years and the resulting temperature distribution in the core is basically different from that of conventional baking operations. Figure 2 shows temperature distribution in a core during baking. Left diagram shows distribution in the case of conventional heating, wherein the highest temperature prevails at the outside and the lowest at the inside. Hence the outside dries first, forming a relatively hard crust. As the thickness of the dry layer increases, complete drying of the wet center becomes increasingly difficult. Remedy is possible by drying in an atmosphere of controlled moisture content, thus delaying drying of the outside.

In dielectric heating, as shown in Fig. 2 at right, heat is generated within the core, the temperature drop toward the surface is caused by heat losses from the surface, and the highest temperature exists at the center. Because no hard dried crust is formed on the outside, much higher heating rates can be applied.

Heat and Moisture Flow Opposed

When drying molds by conventional heating methods, the flow of moisture and of heat are in opposite directions (Fig. 3, left). Heat flows toward the center, and moisture to the outside. Hence the moisture carries that part of the heat which has reached inner parts of the mold back toward the surface. A decreased apparent thermal conductivity of the sand results. In the case of the metal in the mold (Fig. 3, right), the inside surface temperature of the mold increases rapidly and drives the moisture toward the outside. The heat flow is in the same direction and consequently the flow of moisture supports the heat flow, resulting in an apparent higher thermal conductivity of the sand.

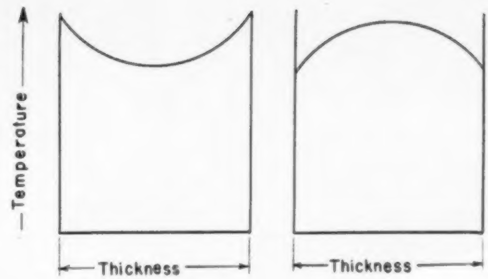
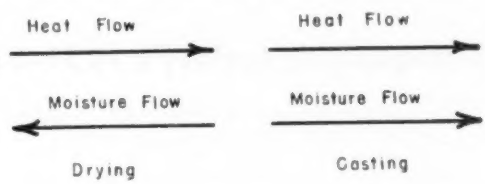


Fig. 2. Conventional core baking (left) dries the core from the surface toward the center. Dielectric baking (right) generates heat within the core giving a surface temperature which is lower than at the core center.

Fig. 3. In drying a mold, heat flows against moisture. When a casting is poured, the heat it gives off and the moisture from the green sand flow in the same direction.



All too little is known about heat flow in foundry work today. Knowledge of how a casting behaves thermally under prevailing operating conditions, based upon close observation by the foundryman, and followed up by an attempt to change conditions, will go a long way toward achieving the ultimate goal of heat transfer research—the production of better and more economical castings.

Labor Secretary Tobin Urges Step-Up In Apprentice Training for Defense

Training of apprentices will play a big role in providing the skilled manpower necessary to carry out the tremendous defense production task facing the United States, according to Secretary of Labor Maurice J. Tobin, speaking before a three-day joint meeting of State and Territorial apprenticeship agencies.

Secretary Tobin compared the present labor situation with that of World War II and stressed the vital part played by apprenticeship in national production. "It is largely through apprenticeship that America has the greatest production capacity of any nation. The more we increase that capacity, the stronger we are going to be," he said.

To this end, the Labor Department's Bureau of Apprenticeship as part of its technical assistance program for defense industries is offering reprints of a technical talk on *"Training at the Utah Copper Division, Kennecott Copper Corporation."*

Copies may be obtained without charge from the United States Department of Labor, Bureau of Apprenticeship, Division of Publications, Washington, D. C.

CHAPTER OFFICERS CONFERENCE

Inaugurates Society's 1951-52 Chapter, National Activities

In a two-day intensive study of A.F.S. activities and policies, officers from each of the Society's 40 chapters met at the LaSalle Hotel, Chicago, June 25 and 26 at the 8th Annual Chapter Officers Conference. Meeting with the chapter representatives were National President Walton L. Woody, National Malleable & Steel Castings Co., Cleveland, President-Elect Walter L. Seelbach, Superior Foundry, Inc., Cleveland, conference chairman, Vice-President-Elect I. R. Wagner, Electric Steel Castings Co., Speedway City, Ind., a number of A.F.S. national directors, and members of the National Office staff.

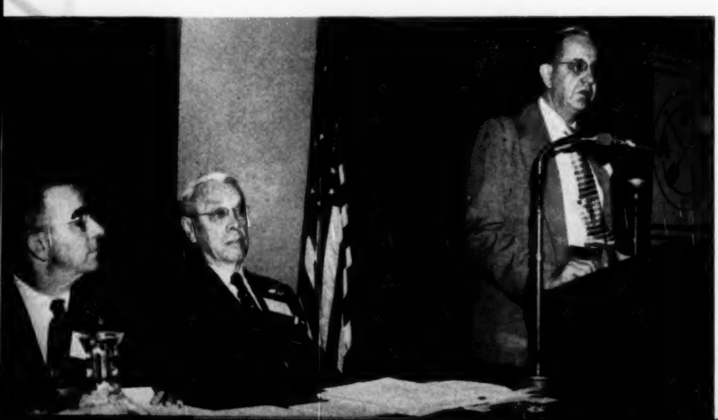
President Woody led off with a discussion of A.F.S., citing its long background as a technical society and its traditional role as a potent factor in foundry educational and technological activities. He differentiated between A.F.S. and the foundry trade organizations.

Secretary-Treasurer Wm. W. Maloney described the operations of the National Office. He told how the facilities and staff are used in serving the membership and the industry and outlined staff duties.

The technical activities of the Society were outlined by Technical Director S. C. Massari who described the approximately 100 technical committees and the eight technical divisions and how they operate in developing information for presentation at Annual Conventions and for publication. A.F.S. research projects—numbering nine which are wholly or in large part supported with Society funds—were described. Preparations for an enlarged safety, hygiene, and air pollution program are underway, he said.

American Foundryman operations were briefed by Herbert F. Scobie, editor, and Terry Koeller, advertising and promotion manager. Emphasizing the technical makeup of the magazine, Scobie pointed out that "The Foundrymen's Own Magazine" is the official publication of the world's largest foundry society. Miss Koeller reported progress in sale of advertising and predicted that American Foundryman would not only continue to stay out of the red but would someday be able to expand and contribute to the financing of research and other activities.

In a session on regional conferences, President Woody and Secretary-Treasurer Maloney gave sug-



Conference Chairman Walter L. Seelbach, A.F.S. National President-Elect, opens the two-day Chapter Officers Conference at Chicago's LaSalle Hotel. Seated at the speakers' table are Vice-President Elect I. R. Wagner, left, and National President Walton L. Woody.

gestions for planning regional meetings and promised cooperation of the National Office.

Luncheon speaker was George K. Dreher, Foundry Educational Foundation, Cleveland. He looked to A.F.S. for continued cooperation, he said, and told what the Society has done and what the chapters and companies can do to promote foundry education.

In one of the longest sessions of the conference, chapter officers discussed chapter programs under the direction of Technical Director Massari.

Conference attendants got a pre-view of a new type of program built around a tape recording of a technical talk and lantern slides. Secretary-Treasurer Maloney discussed the program chairman's job, and Conference Chairman Seelbach made suggestions for planning national officer visits.

The session on chapter educational activities was conducted by George J. Barker, University of Wisconsin, chairman of the Educational Division, and Technical Assistant Jos. E. Foster. Prof. Barker described the organization of a chapter educational committee, development of management cooperation, lecture courses, field trips, and in-plant training courses, and discussed contacts with schools and A.F.S. student chapters. Foster reported on the 1951 A.F.S. Apprentice Contest and urged chapters to plan now for participation in the 1952 competition.

Chapter administration was covered in a session under Chairman Seelbach and Secretary-Treasurer Maloney. Responsibilities of the chapter chairman and board of directors, national director visits, and chapter continuity and growth were developed in a three-quarter hour session. Maloney followed this with details of Society and chapter finances and financing.

At the Conference Dinner, Kenneth M. Morse, safety, hygiene, and air pollution specialist who will join the A.F.S. staff August 1, was introduced. After dinner speaker was Carl Taylor, president, Waukesha State Bank, Waukesha, Wis., whose subject was "*America Tomorrow*."

The second day of the conference started with a session on membership work. Led by Secretary-Treasurer Maloney, assisted by LaVerne Lahn, membership supervisor, the session covered processing of memberships in the National Office, work of the chapter membership committee, and membership solicitation.

President Woody announced that the A.F.S. Building Project Committee had recommended that Society headquarters be established in the outskirts of Chicago and that a new building be erected. It is a project of the membership, he said, praising those who have contributed to the fund for their interest in advancing their industry and their Society.

Chairman Seelbach, President Woody, Vice-President-Elect Wagner, and Secretary-Treasurer Maloney participated with the chapter officers in a discussion of management meetings and community relations. Management recognizes its stake in the Society, declared Wagner, and cited as evidence its participation in management meetings, in the Housing Fund, and in urging A.F.S. membership for employees.

In discussing community relations, Maloney pointed out that an A.F.S. chapter is the representative of the foundry industry in its community as well as of the foundry industry's international technical society.

Following luncheon, Maloney again took the floor

A.F.S. National Director Lloyd D. Wright, United States Radiator Co., Geneva, N. Y., receives a welcoming smile from Miss Mary Brudny of the National Office staff as she pins on his Conference badge.

Common interests bridge a several-thousand mile gap as Metropolitan Chairman D. Frank O'Connor, O'Connor's Foundry, Hackettstown, N. J., left, and Philadelphia Chapter Chairman George Bradshaw, Philadelphia Naval Shipyard, talk over chapter problems with Mexico City Chapter Chairman N. S. Covacevich, La Consolidada S. A., and Vice-Chairman Juan Latapi Sarre, Fundiciones de Hierro y Acero, Mexico City.

Two foundrymen from the Lone Star State—Texas Chapter Chairman John Bird, American Brass Foundry, Fort Worth, left, and Vice-Chairman P. B. Croom, Houston Pattern Works, Houston, look over a few of the AMERICAN FOUNDRYMAN *reprints that have received extensive distribution in foundries.*

to outline plans for the 1952 International Foundry Congress to be held in Atlantic City, N. J., May 1-7. He met with foundrymen in seven European countries during a recent visit, he said, to make preliminary plans for attendance of some 200 international visitors during next year's week-long Convention and Exhibit. President Seelbach, he concluded, would be the Society's official representative to the 1951 International Foundry Congress in Brussels, Belgium.

The conference concluded with The Shakeout, catch-all session for questions and answers.

Directors And Guests Participate

Participating in the 8th Annual Chapter Officers Conference in addition to those mentioned, were the following national directors: T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa.; L. C. Farquhar, Sr., American Steel Foundries, East St. Louis, Ill.; J. J. McFadyen, Galt Malleable Iron Co., Galt, Ont., Canada; Martin J. O'Brien, Jr. Symington-Gould Corp., Depew, N. Y.; J. O. Ostergren, Lakey Foundry & Machine Co., Muskegon, Mich.; F. G. Sefing, International Nickel Co., New York; Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill., James Thomson, Continental Foundry & Machine Co., East Chicago, Ind.; and L. D. Wright, U. S. Radiator Corp., Geneva, N. Y.

Directors-elect present were Harry W. Dietert, Harry W. Dietert Co., Detroit, and J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala. Guests included FEF Chairman Claude B. Schneible, Claude B. Schneible Co., Detroit; Prof. R. E. Kennedy and Roy W. Schroeder, University of Illinois (Navy Pier), Chicago; C. E. Hoyt, retired A.F.S. executive vice-president; and Wm. G. Gude, Penton Publishing Co., Cleveland.

All Chapters Represented

Chapter officers present were chiefly chairmen and program chairmen (usually also vice-chairman). They were:

BIRMINGHAM—Program Chairman Fred K. Brown, Adams Rowe & Norman, (also V. C.), and Secretary-Treasurer John F. Drenning, Kerchner, Marshall & Co., Birmingham, Ala.

BRITISH COLUMBIA—Chairman W. M. Armstrong, University of British Columbia, Vancouver, and Program Chairman Herbert Heaton, Heap's Engr. Ltd., New Westminster, B. C., Canada (also V. C.).

CANTON DISTRICT—Chairman C. B. Williams, and Secretary Wendell W. Snodgrass, Massillon Steel Castings Co., Massillon, Ohio.

CENTRAL ILLINOIS—Chairman R. E. Dickison, Brass Foundry Co., Program Chairman G. H. Rockwell (also V. C.) and Secretary-Treasurer B. L. Bevis, Caterpillar Tractor Co., Peoria, Ill.

CENTRAL INDIANA—Chairman Robert Spurgin, Swayne, Robinson & Co., Richmond, Ind., and Vice-Chairman Carl O. Schopp, Link-Belt Co., Indianapolis, Ind.

CENTRAL MICHIGAN—Chairman Thomas T. Lloyd, Albion Malleable Iron Co., Albion, Mich., and Secretary-Treasurer R. K. Moore, Foundries Materials Co., Coldwater, Mich.

CENTRAL NEW YORK—Chairman Wm. D. Dunn, Oberdorfer Foundries, Inc., Syracuse, N. Y., and Vice Chairman Don J. Merwin, Oriskany Malleable Iron Co., Oriskany, N. Y.

CENTRAL OHIO—Chairman W. T. Bland, Commercial Steel Casting Co., Marion, Ohio, Vice-Chairman E. M. Durstine, Keener Sand & Clay Co., and Secretary N. H. Keyser, Battelle Memorial Institute, Columbus, Ohio.

CHESAPEAKE—Chairman Allen S. Kittrell, Leach Pattern Shop, Baltimore, Md., Program Chairman C. W. Galloway, Chambersburg Engineering Co., Chambersburg, Pa. (also V.C.), and Secretary-Treasurer C. A. Robeck, Gibson & Kirk Co., Baltimore.

CHICAGO—Chairman Walter W. Moore, Burnside Steel Foundry Co., and Vice-Chairman John Owen, Harbison-Walker Refractories Co., Chicago.

CINCINNATI DISTRICT—Chairman A. W. Schneble, Advance Foundry Co., Dayton, Ohio and Program Chairman B. A. Genthe, S. Obermayer Co., Cincinnati (also V.C.).

DETROIT—Chairman Vaughan C. Reid, City Pattern Foundry & Machine Co., and Vice-Chairman Michael Warchol, Atlas Foundry Co., Detroit.

EASTERN CANADA—Chairman W. Turney Shute, Canadian Car & Foundry Co., Ltd., and Program Chairman A. J. Moore, Montreal Bronze Ltd., Montreal, Que., Canada (also V.C.).

EASTERN NEW YORK—Chairman John E. Waugh, General Electric Co., Schenectady, N. Y., and Program Chairman Leigh M. Townley, Adirondack Foundries & Steel, Inc., Watervliet, N. Y. (also V. C.).

METROPOLITAN — Chairman D. Frank O'Connor, O'Connor's Foundry, Inc., Hackettstown, N. J., and Vice-Chairman J. S. Vanick, International Nickel Co., New York.

MEXICO CITY—Chairman N. S. Covacevich, La Consolidada S. A., and Program Chairman Juan Latapi Sarre, Funcidiones de Hierro y Acero S. A., Mexico, D. F., Mexico (also V.C.).

MICHIANA—Vice-Chairman Andrew Peterson, Oliver Corp., South Bend, Ind., and Secretary-Treasurer Vincent C. Bruce, Frederic B. Stevens, Inc., Elkhart, Ind.

MO-KAN—Chairman E. C. Austin, Jr., National Aluminum & Brass Foundry, Independence, Mo., and Vice-Chairman John Redman, Jr., Redman Pattern Works, Kansas City, Mo.

NORTHEASTERN OHIO—Chairman Gilbert J. Nock, Nock Fire Brick Co., and Program Chairman Frank C. Cech, Cleveland Trade School, Cleveland, (also V.C.).

NORTHERN CALIFORNIA—Chairman Philip C. Rodger, General Metals Corp., Oakland, Calif., and Program Chairman George W. Stewart, Fast Bay Brass Foundry, Richmond, (also V.C.).

NORTHERN ILLINOIS-SOUTHERN WISCONSIN—Chairman Carl L. Dahlquist, Greenlee Bros. & Co., Rockford, Ill.

NORTHWESTERN PENNSYLVANIA—Chairman J. Douglas James, Cooper-Bessemer Corp., Grove City, Pa., and Program Chairman Fred J. Carlson, Weil-McLain Co., Erie, Pa., (also V.C.).

ONTARIO—Chairman R. H. Williams, Canadian Westinghouse Co., Ltd., Hamilton, Ont., and Program Chairman Andrew Reyburn, Cockshutt Plow Co., Ltd., Brantford, Ont., (also V.C.).

(Continued on Page 95)

PLANS LAUNCHED TO SELECT NEW A.F.S. HOMESITE

WITH THE A.F.S. BUILDING FUND already exceeding its three-year goal and new contributions coming in daily, the Society's Housing Committee has begun preliminary investigations to determine a site for a Permanent Home for A.F.S.

Recommendations of the Committee as to location, whether to build or purchase an existing structure, etc., will be submitted to the Society's Board of Directors for consideration at its Annual Meeting this summer. The decision of the Board will then be announced to the membership and plans will go into final stages for a Permanent Home that will be worthy of the American Foundrymen's Society's position in the metals industry as the world's leading foundry technical organization.

CHARTER SUBSCRIBERS

(May 20-June 20)

INDIVIDUAL CONTRIBUTORS

George W. Cannon, Sr., George W. Cannon Co., Muskegon, Mich.
George S. Grossman, Accurate Metal Laboratories, Chicago.
L. G. Gustafson, Central Foundry & Machine Company, East Chicago, Ind.
William C. Kremer, Archer-Daniels-Midland Co., Chicago.
A. H. Van Keuren, Rear Admiral, USN (Retired) Washington, D.C.
Victor E. Zang, Toledo, Ohio.

COMPANY CONTRIBUTORS

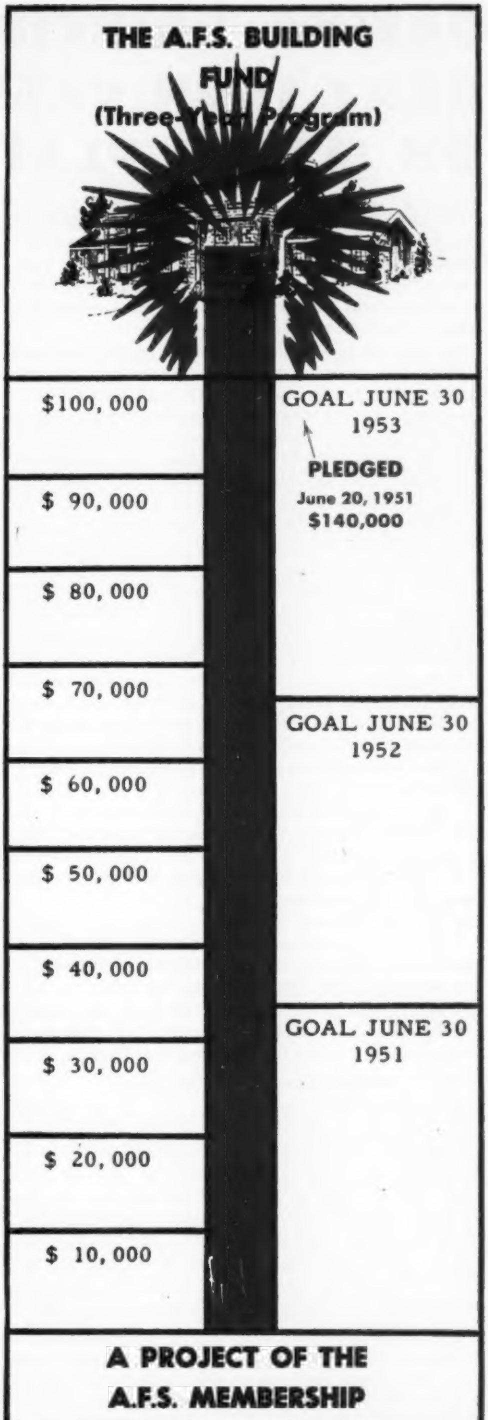
Baroid Sales Div., National Lead Co., Los Angeles.
*Brass & Bronze Ingot Institute, Chicago.
George W. Cannon, Sr., George W. Cannon Co., Muskegon, Mich.
The Dow Chemical Co., Midland, Mich.
Dreisbach Engineering Corp., Yonkers, N. Y.
Nash Motors Div., Nash-Kelvinator Corp., Kenosha, Wis.
Pacific Brass Foundry of San Francisco, San Francisco.
The Henry Souther Engineering Co., Hartford, Conn.,
Unitcast Corporation, Toledo, Ohio.
U. S. Foundries, Inc., Denver.
*Original Contribution Increased

Three-Session Dietert Sand School Scheduled for Detroit August 20-22

PRACTICAL FOUNDRY SAND CONTROL will be the subject of a three-session Sand School to be conducted at Detroit's Engineering Society Auditorium August 20, 21 and 22 by the Harry W. Dietert Co. of that city. The school is open to all interested foundrymen free of charge and will be conducted by Frank S. Brewster of the Dietert Co.

Sand control topics to be covered include: how and what tests should be made, their interpretation and relationship to casting results and easier production of molds and cores from the point of view of the sand engineer, and discussion of individual problems.

Facilities for luncheon, parking and hotel accommodations will be provided. Interested foundrymen are requested to make reservations for the course by writing Frank S. Brewster, general manager, Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4.



GATING PRINCIPLES APPLIED TO GRAY IRON CASTINGS PRODUCED ON MATCH PLATES

A. J. Howarth

CERTAIN PRINCIPLES must be followed by all foundries if they are to produce sound, quality castings. Among the requirements usually demanded of castings are that they be dimensionally accurate and free of internal and external shrinkage, blow holes, and other surface defects.

In order to produce a quality casting all materials and equipment must be of the proper type for the size of casting being produced. Although materials and equipment are of the right kind and the molding operation is properly performed, defective castings will result if gating and risering techniques are inadequate.

In some foundries gating systems are devised with no thought in mind except to fill the mold cavity with molten metal. While the primary purpose of the gating system is to fill the mold cavity there are other functions the gate must perform:

1. Fill the mold cavity as rapidly as possible without erosion of the mold surfaces.
2. Prevent sand and slag inclusions from entering the mold cavity.
3. Establish proper temperature gradients in the mold so that the gating system will "feed" the casting during solidification, thereby eliminating in some degree both internal and external shrinkage.

To accomplish these aims certain measures must be taken:

1. Proper location of patterns on the plates.
2. Proper transfer of molten metal from the ladle to the pouring basin.
3. Provision for a runner which will control the metal entering the mold cavity.
4. Temperature of the metal.
5. Proper size and location of risers on certain types and designs of castings to compensate for volume losses due to unequal cooling during solidification.
6. Gates which can be removed from the casting without breaking into casting surfaces, and which leave a minimum of metal for grinding or chipping.

Mount Gating System on Pattern

The gating system should be a part of the pattern equipment since the size and location of the gates and runners are important in controlling the quality of the casting. The runner should be placed in the cope and the gate in the drag, although it may be necessary in some cases, due to casting design, to place the gate in the cope also.* The runner in the cope aids in preventing sand and slag from entering the mold cavity during the pouring operation and often compensates for the natural shrinkage of the metal during solidification.

* Editor's Note: A.F.S.-sponsored research directed by the Aluminum & Magnesium Division's Research Committee indicates that unusually good freedom from cope defects results when the runner is in the drag and gates are in the cope.

Proper sprue height is essential. This height should range from 2 to 5 in. above the casting to secure the necessary ferrostatic or head pressure which is an aid in prevention of shrinkage. Sprues should not be too small in diameter or the effect of the head pressure will be lost due to the rapid cooling of the small sprue.

The metal can be choked in the sprue, in the runner bar, or in that part of the gate nearest the runner bar. The choke should not be placed in the gate at the point where the metal enters the mold cavity, as this condition will produce a nozzle effect and may cause a cutting and washing action on the mold surface which will result in defective castings.

The cross-sectional area of a gate should not exceed the cross-sectional area of the casting wall at the entrance to the mold cavity. If the gate area exceeds the casting area difficulty will be encountered when breaking off gates and broken castings may result.

It will be noted in the photographs that the tendency

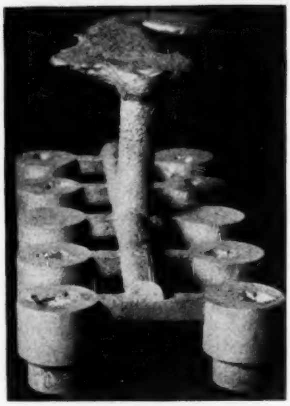


Fig. 1 (above)—Improper gating of this matchplate group resulted in shrinkage defects.

Fig. 2 (left)—The use of a large sprue did not eliminate shrinkage except in the two castings directly under the sprue, one of which shows an inclusion.

Fig. 3 (right)—shrinkage was eliminated by use of a larger sprue and runner.

in gating system design is to over gate and under sprue. To overcome this tendency on the part of supervisors it is recommended that a gating engineer be appointed in high production mechanical foundries. A gating engineer will be of very practical value to a foundry organization through the adoption of uniform methods, relieving foundry supervisors of the duty of pattern layout of plates and gating and risering problems; this in turn will allow more time for supervision of molding and pouring operations.

The accompanying photographs show the importance of correct gating systems in the production of sound castings. In the instances shown, the corrective measures adopted entailed no changes in the existing equipment except gating. The metal composition of all the castings considered in this paper is: total carbon, 3.40-3.50 per cent; silicon, 2.35-2.45; manganese, 0.65-0.75; phosphorus, 0.20-0.30; sulphur, unknown. The pouring temperatures varied during pouring, ranging from 2550 to 2650 F.

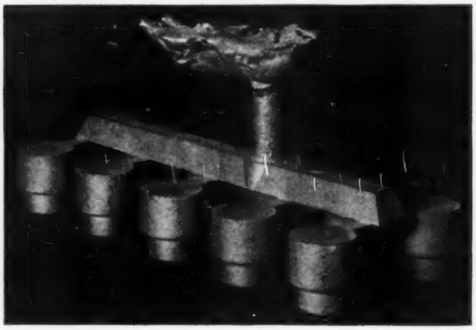
Gating System Causes Shrinkage

Figure 1 shows a match-plate group of improperly gated castings, with a visible shrink on the surface of each casting. The gating system has a small runner bar and two small diameter sprues, with a hand-cut pouring basin. The reason for the shrinks is too rapid cooling of the sprues, runner bar and gates, which prevented "feeding" during solidification. The molds were made in pop-off flasks 11x18x4-in. drag and 5-in. cope at the rate of 450 per 8-hr day. The total weight of castings and gates was 14.5 lb. After gating and pouring basin revision the total weight was 13.5 lb.

Figure 2 shows the same casting and the attempt to eliminate shrinkage through the use of a larger sprue. This procedure was unsuccessful in eliminating shrinkage except for the castings attached to the gates directly under the sprue. These two castings are free of visible shrinks, but the casting on the right shows some sand or slag inclusion on the surface directly in front of the gate. The reason these two castings show no shrinkage is due to the sprue being placed directly over the gate, which maintained a high temperature in the gate area and allowed the castings to feed properly during solidification. However, it is poor practice to place sprues directly over gates as no provision can be made to trap "dirt" before the molten metal enters the mold cavity.

Figure 3 shows the same group of castings with a larger sprue and runner bar. In this case the runner bar acted as a blind riser and dirt catcher. The ends and top of the runner show that dirt rose to the surface and was trapped instead of flowing into the mold cavity. The runner bar and sprue maintained the proper temperature gradient in the gates and allowed the ferrostatic pressure to feed the castings during solidification.

Figs. 4 (above) and 5 (below)—Shrinkage defects in this casting group were eliminated by use of a single large sprue and one-half reduction in gating area. Molds were made in pop-off flasks 11x18x4-in. drag and 5-in. cope. Original total weight, 13 lb, 4oz. Weight after gate, sprue and runner bar revision, 12 lb, 8 oz.



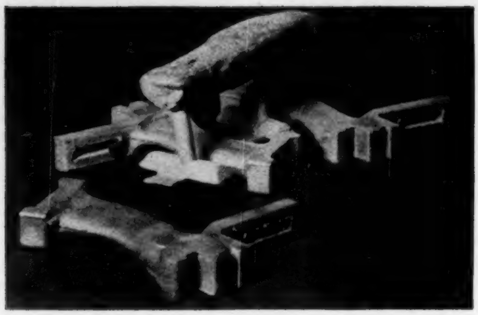
The hand-cut pouring basins shown in Figs. 1, 2 and 3 were later changed to permanent pouring basins, similar to those shown in Figs. 5 and 7, thus further increasing manufacturing efficiency.

Figure 4 shows another set of castings that had excessive scrap losses in the foundry. Losses in the machine shop were also high due to the failure of the casting to withstand the pressure test. These defects were of the same type—shrinkage.

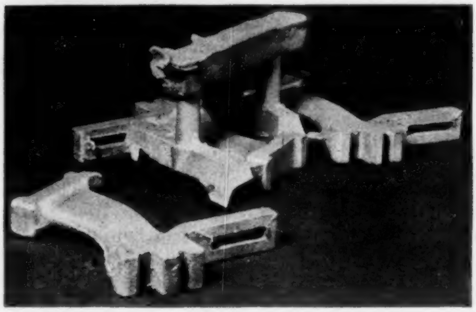
This group of castings was also poured with small sprues. All of the castings show signs of shrinkage defects similar to that in the casting at the right. This casting has a shrinkage depression at the junction of the shoulder and the heavy section.

The second casting from the right, or the center casting of three, as cast, also shows dirt or slag inclusions directly in front of the gate. This is also an improper application of the sprue. Also, the theory that small diameter sprues will prevent dirt or slag from entering the mold cavity is disproved.

Shrinkage depressions in the runner bar will also be recognized. The location of these depressions is interesting, occurring directly in front of and above the gates to the two center castings, showing the effects of the temperature gradients in the mold. This shows



Figs. 6 (above) and 7 (below)—Small sprues and gates and mounting the sprues directly over the gates caused shrinkage in this casting group. Center casting is double gated; outside castings have only one gate. Corrective measures applied (below) were a larger sprue, runner, and gates. Molds were made in a pop-off flask, 11x18x4-in. drag and 5-in. cope. Original weight, 15 lb. Weight after gating revision totaled 14 lb, 6 oz.



the heaviest section of the center castings connected to the gate, maintaining temperature at higher levels for a longer period of time, with the runner bar feeding these castings during the solidification process.

The gate area of the casting that has been removed, and the slight depression just above the gate, should be noted. This shows that the runner bar tried to function as a feeder but was prevented, due to the rapid cooling of the small section of the casting. The final result on this set of castings was 100 per cent rejects in the foundry.

Figure 5 (the same casting group as Fig. 4) shows the effect of a smaller gate and larger sprue. None of the castings on this set was subject to rejection. In this case the gate area was reduced 50 per cent. A slight change in runner-bar design was made, and one large diameter sprue used in place of three small ones. This method effectively eliminated all shrinks and dirt inclusions as the runner bar effectively trapped all dirt before it could enter the mold cavity.

This group of castings is also a study in the control of directional solidification. It is believed that the patterns are incorrectly mounted, and that the only consideration given to the problem of mounting was to place as many patterns in a flask as possible.

In controlling shrinkage defects thought must be given to the solidification of molten metal in the mold cavity. It should be recognized that the first metal to enter the mold cavity flows to the part farthest from the gate and then rises to the top of the mold cavity. Consequently, when the mold cavity is filled solidification begins at the point farthest from the gate and in the lightest section of the casting.

As solidification takes place the change in volume of metal must be compensated for by feeding, either by use of the gating system where practical or through the use of risers. The center castings in Fig. 5 are the only two having the gate correctly located to control shrinkage. The explanation is that the first metal to enter the mold cavity reaches to the small neck and oil snout first and rises to the top; the mold is progressively filled through the heavier sections as the pouring is completed. The metal with the highest temperature is then in the sprue and runner bar.

Solidification then starts in the oil snout and small neck of the casting, and the change in volume in these small sections is compensated for by feeding from the heavier sections of metal at the junction of the shoulder and heavier part of the casting. During this process the ferrostatic pressure applied by the sprue and the proper temperature gradients at the junction of the runner bar and gate are functioning and feeding metal into the heavier sections of the casting to compensate for the loss in volume. Solidification in this

Figs. 8 (above) and 9 (below)—Two castings molded in a 14-in. square steel flask, 4-in. drag and 5-in. cope, and gated at the small end, had excessive scrap in foundry and machine shop due to shrinkage and inclusions because of improper riser application. Gating and risering revision, with the castings poured through the riser and gate area reduced one-half, eliminated the shrinkage and inclusion defects. Total casting weight, 20 lb.

case is progressive and controlled from the point farthest from the gate.

The outside castings of this group can be produced with the present method, but the risk of producing defective castings is greater with the normal variables of foundry operation such as moisture, mold hardness, metal temperatures, and composition.

Figure 6 shows a set of castings mounted in such a way that a good gating practice is difficult to apply. The small sprues and gates should be noted, and also that the center casting is double gated while the outside castings have only one gate. This means unequal filling of the mold cavities and unequal feeding during solidification.

The gates are too small to properly feed the casting, and the sprues are directly over the gates. Both conditions are detrimental to the production of quality castings. Some of the shrinkage defects are plainly visible in the castings in this group.

Gates Placed in Heavy Sections

Figure 7 shows the same casting group as Fig. 6 and the corrections made in the gating system. In this case a larger sprue, runner bar, and gate were used. The gates were placed in the heavy sections of the castings where shrinkage defects occurred, and the sprues placed between the gates entering the mold cavity to allow the runner bar to function as a dirt catcher. Inclusions will be noted trapped at the junction of the gate and runner bar and on top of the runner bar. This is another example of the proper application of a gating system that will aid in the elimination of shrinkage and defects caused by sand or slag inclusions.

Figure 8 shows the improper application of a riser for feeding purposes. This particular casting resulted in excessive losses in both foundry and machine shop. Two castings were made in a tight flask and gated on

the small end. In pouring, the mold cavity is partly filled when the metal enters the riser gate. As pouring continues the riser fills at the same speed and level as the mold cavity; therefore, upon completion of the pouring operation the coldest metal is in the riser.

It should also be noted that the riser is offset from the riser gate, thus allowing the riser gate to freeze too quickly for the riser to function as a feeder. As the casting solidifies the light sections set first and draw metal from the heavier sections and the last to solidify, causing internal shrinkage and porous castings that will not withstand a pressure test.

The top of the riser has a slight depression, indicating that it had tried to function but was unable to do so because of the improper application of temperature gradients. Sand and slag inclusions can also be noted on the surface of the casting. These are probably caused by slow pouring speed and the runner being ineffective as a dirt trap.

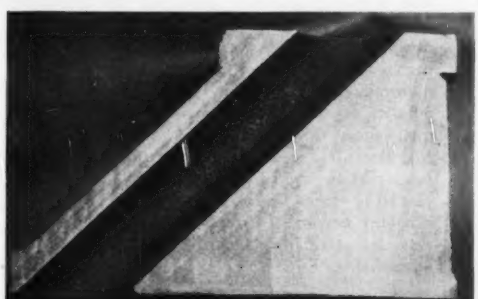
Pour Through Riser

Figure 9 shows the same casting as Fig. 8, but with corrections in gating and risering. In this case the casting is poured through the riser, thus allowing the temperature gradient to function properly. The first metal to enter the mold cavity proceeds to the points farthest from the gate, the mold fills progressively, the last and hottest metal being in the riser.

This condition allows the riser, with its higher temperature, to keep the gate fluid so that the head of the metal in the riser will feed the casting during solidification. The shrinkage or piping that has taken place in the riser shows that it has functioned properly.

The gate area in Fig. 9 should also be noted. This gate has acted effectively in controlling shrinkage but is only half the size of the riser gate shown in photograph of Fig. 8. The riser can also act effectively as a

Fig. 10 (above)—Sectioned gear casting had high machine shop losses due to shrinkage caused by improper feeding through small gates and runner. Fig. 12 (left)—Small sprues, gates, and runner which produced defective casting (Fig. 10) are shown at left of photo. Properly proportioned sprue, gate, and riser system which produced sound casting (Fig. 11) are at right. Fig. 11 (below)—Revision of the gating system eliminated shrinkage defects.



dirt catcher. Any dirt, slag, or sand that enters the runner will float to the top of the riser.

The reduction in the size of the gate also means that less grinding time will be required to remove the gate. Also, due to the shape of the casting, less mutilation of the part will take place during grinding operations, thereby further improving the efficiency of foundry operations.

Figure 10 shows the section of a casting that had very high losses in the machine shop due to the plainly visible porosity. This defect proved to be due to shrinkage, which in turn was caused by unequal cooling, and improper feeding during solidification. The gating system was too small to allow correct feeding of the heavy sections during solidification.

Figure 11 shows a section of a similar casting (somewhat larger than that shown in Fig. 10) after changing the gating system, which had been identical for both castings. This gear section is free of shrinkage.

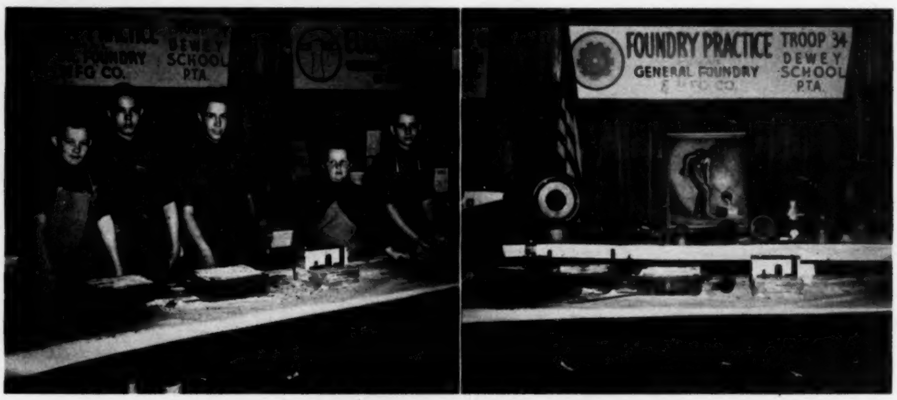
Figure 12 shows the gating systems used to pour the castings in Figs. 10 and 11. The gate used in the production of the casting in Fig. 10 is on the left. Due to the small size of the sprues, gate, and runner the sprue freezes too rapidly for the pouring basin to exert ferrostatic pressure. The runner bar is also small and can neither feed the casting nor trap the dirt.

The gate and riser system used to produce the casting shown in Fig. 11 is on the right. The sprue is in correct proportion to the size of the gate. Also, the runner bar extends beyond the last gate and riser. This extension is an aid in trapping any loose sand or slag that may be washed into the runner during the first stage of pouring.

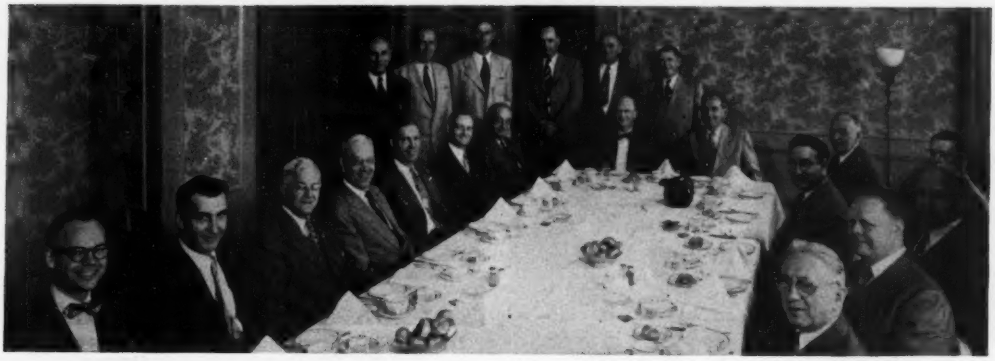
The riser is placed directly over the gate entering a critical area of the mold cavity and close to the pattern. This provides the necessary temperature gradients to allow proper feed metal to be supplied during solidification. The piping effect in the top of the riser indicates that the riser has performed its function.

The center figure in this group is a sectioned riser showing the amount of shrinkage that has taken place and the amount of porosity that is contained in the riser. This example indicates the importance of correct placement of the riser and runner in the elimination of shrinkage and porosity. Other examples show that in some cases pouring through a casting into a riser is not nearly as effective in the control of shrinkage as pouring through a riser into a casting.

Demonstrate Molding, Coremaking at Flint, Mich., Scout Exposition



Sponsored by the General Foundry & Manufacturing Co., this booth at the Flint, Mich., Boy Scouts Exposition attracted the attention of some 7500 spectators, who watched the scouts demonstrate molding and coremaking, explaining each step as they worked. The booth was manned entirely by boys 11 to 15 years old, who as a result of their work became the first area scouts to qualify for the Foundry Practice merit badge, and who won the Exposition's blue ribbon award over some 85 booths representing local industries. General Foundry's assistant personnel director, Paul Van Amburg, was delegated by General Manager Oscar E. Sundstedt to assist and train boy scouts of Troop 34, Dewey School, Flint, in molding and coremaking and in general foundry practice. The booth was operated for two-eight-hour days by the scouts, with no adults permitted in the booth, including the troop's scoutmaster and Mr. Van Amburg. Flint arrowheads cast in aluminum were donated as souvenirs by the Genesee Brass & Aluminum Co. of Flint and by General Foundry & Manufacturing Co., which also donated a display of castings to the booth. According to Mr. Van Amburg, comments of spectators indicate that the work of the scouts has done a great deal to make the people of Flint aware of the vital part the foundry plays in supporting the community and in providing tools for better living.



Attending the Annual Meeting of the A.F.S. Technical Correlations Committee at the Congress Hotel, Chicago, June 4 were, seated, clockwise around table from lower left: H. F. Scobie, Milton E. Annich, James Thomson, A.F.S. President Walton L. Woody, Clyde B. Jenni, A.F.S Technical Assistant Jos. E. Foster, H. M. St. John, George P. Halliwell, Committee Chairman Norman J. Dunbeck, W. R. Jaeschke, Charles Locke, Robert P. Schauss, J. S. Vanick, Karl J. Jacobson and W. D. McMillan. Standing at rear, left to right, are: Technical Director S. C. Massari, Walter E. Sicha, W. W. Levi, V. A. Crosby, Ralph L. Lee and Prof. George J. Barker. Represented at the meeting were the A.F.S. technical divisions, general interest committees, national officers and directors and the staff personnel of the American Foundrymen's Society.

CORRELATION COMMITTEE MEETS TO PLOT A.F.S. TECHNICAL COURSE

FUTURE TECHNICAL PLANS FOR A.F.S. headed the agenda of the annual meeting of the Society's Technical Correlation Committee, held at the Congress Hotel, Chicago, June 4. Made up of chairmen and vice-chairmen of the A.F.S. technical divisions and chairmen of the general interest committees, the committee discussed plans for the 1952 A.F.S. International Foundry Congress, dissolution of inactive committees and consideration of need for new ones, and reported on current activities and projects.

Under the chairmanship of National Director N. J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio, the meeting opened with a few words of appreciation from President Walton L. Woody for the excellent cooperation extended him during his term of office.

Chairmen of the various technical divisions and general interest committees were then called upon to report on the activities of their respective divisions. Summarized, they are:

Aluminum & Magnesium Division. Plans to publish material presented in the symposium on *"Principles of Gating and Risering"* at the 1951 A.F.S. Convention. Data are being assembled on properties of aluminum casting alloys and similar data on magnesium alloys will shortly be accumulated. Research continues on means for identifying degrees of casting surface finish. Reports on work by the Canadian Bureau of Mines on centrifugal casting will be reviewed for possible publication by A.F.S. Several sections of the proposed DESIGN MANUAL have already been written. Research Committee plans to produce a new motion picture at Battelle Memorial Institute which will deal with sprue base design and runner geometry and aluminum alloy castings production. Arrangements are being made with several foundries to assess suitability of a design for separately cast test bars based on results of fluid flow investigations at Battelle.

Several committees have already arranged for preparation of papers to be presented at the 1952 International Foundry Congress. Newly-elected chairman of the division is Hiram Brown, Solar Aircraft Corp., Des Moines, who replaces Walter E. Sicha, Aluminum Co. of America, Cleveland. New vice-chairman and secretary, respectively, are M. E. Brooks, Dow Chemical Co., Bay City, Mich., and R. F. Thomson, General Motors Corp., Detroit.

Brass and Bronze Division. Research program at the University of Michigan on development of a *"Quick Fracture Test for Brass and Bronze Foundry Alloys"* studied factors which might affect character of test block fractures, based upon its 1949-50 research. Progress report on this test was presented at the 1951 A.F.S. Convention and attempts have been made to get commercial foundries to use the test, which can be completed in three minutes. Handbook on RECOMMENDED PRACTICES FOR BRASS AND BRONZE FOUNDRY ALLOYS is in the second stage of correction and revision and it is hoped the handbook will be ready for distribution before the 1952 A.F.S. International Foundry Congress. Round Table Committee developed a highly successful discussion procedure at the Convention in Buffalo, i.e., each table was given a specific foundry problem to discuss and solve in less than 10 minutes. Solution was then read aloud and discussed by the

W. D. McMILLAN
Chairman
MALLEABLE DIVISION

CLYDE B. JENNI
Chairman
STEEL DIVISION

W. R. JAESCHKE
Chairman
REFRACTORIES COMMITTEE

M. E. ANNICH
Chairman
TIMESTUDY & METHODS COMMITTEE

entire group. All division sessions at the Convention were well attended, particularly the Brass and Bronze Sand Shop Course.

A. K. Higgins, Allis-Chalmers Mfg. Co., Milwaukee, replaces George P. Halliwell, H. Kramer & Co., Chicago, as division chairman. New vice-chairman and chairman of Program and Papers Committee is Bernard N. Ames, New York Naval Shipyard, Brooklyn, with W. B. Scott, National Bearing Div., American Brake Shoe Co., Meadville, Pa., as committee vice-chairman.

Educational Division. Increased interest on the part of management in the work of this Division was evidenced by the caliber of foundrymen who attended the division's Convention session and dinner. Apprentice Contest Committee reports 246 contestants from 76 companies were entered in this year's contest and that eight A.F.S. chapters held local contests in preparation for the event. Two apprentice training projects are proposed for the coming year: (1) two small orientation booklets to be given new employees of the foundry industry, and (2) preparation of a series of outlines for short term courses. Report is being prepared on foundry research projects now under way. A list of speakers on a number of foundry topics is available for chapters desiring speakers for high school and other group meetings.

Plans are underway to promote interest of engineering students in the foundry industry. Proposed and outlined is a sound slide film to sell high school students and their parents on the opportunities offered by the castings industry. Edwin Doe's high school foundry textbook is now in the hands of the printer and should be in print by August. College textbook is partially assembled. The Foundry Course and the Graduate Industrial Training Committees have been temporarily discontinued. Comprehensive outline of a plan to increase interest of A.F.S. chapters in educational activities has been prepared and is being considered by the division.

Principal objectives of the division for the coming year are centered around promotional activities at the high school, trade school and vocational school levels, close cooperation with the Foundry Educational Foundation, and with A.F.S. chapters. George J. Barker, University of Wisconsin, who succeeded the late Alfred W. Gregg, continues as division chairman. William J. Hebard, Continental Foundry & Machine Co., East Chicago, Ind., is the new vice-chairman.

Gray Iron Division. Convention attendance at the division's technical sessions, shop courses and luncheon was unusually good. Chill Test Committee is to be commended for its work, reported at the Convention, "*Chill Tests and the Metallurgy of Gray Iron,*" by D. E. Krause, Gray Iron Research Institute, Columbus, Ohio. Joint efforts of two committees has resulted in publication of "PROGRESS REPORTS NOS. 1 AND 2—RISERING OF GRAY IRON CASTINGS," by A.F.S. The first is a bibliography and the second a study of castings. In preparation is No. 3, which will be a manual of gating and risering terminology.

Microstructure of Cast Iron Committee plans publication of descriptions of metallographic procedures, study of special etchants used in cast iron, various microstructures encountered in cast iron, and development of a technique for sample preparation where influence of factors on structure is being investigated. Newly-created Reclamation Committee, headed by R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J., will attempt a standardization of gray iron reclamation procedures and related practices. W. W. Levi, Lynchburg Foundry Co., Radford, Va., succeeds V. A. Crosby, Climax Molybdenum Co., Detroit, as division chairman. J. S. Vanick, International Nickel Co., New York, is the new vice-chairman.

Malleable Division. Division's research project at the University of Wisconsin, a fundamental study of effects of melting conditions on behavior of malleable iron, is progressing satisfactorily and a report covering the work of the first year is expected to be available early in 1952. Division sessions at the 1951 Convention were extremely well attended. W. D. McMillan, International Harvester Co., Chicago, has been elected division chairman, replacing George E. Bean, Eastern Malleable Iron Co., Wilmington, Del. New division vice-chairman is George Boli, Northern Malleable Iron Co., St. Paul, Minn.

Pattern Division. Pattern Color Committee's recommendations for standard colors will be published in color chart form by A.F.S. in the near future. Pattern Manual Committee has prepared an outline and proposes to incorporate a section on plaster molding in

the proposed manual. Both the pattern technical session and round table luncheon had an excellent turnout at the Convention. New division chairman is E. T. Kindt, Kindt-Collins Co., Cleveland, who succeeds Leonard F. Tucker, City Pattern & Foundry Co., South Bend, Ind. Vice-chairman is Harry Lees, Whitin Machine Co., Whitinsville, Mass.

Sand Division. All Convention sessions were well attended, as were the Sand Shop Courses which covered malleable sand, shell molding, and foundry sand control. Plans to develop a formulated core oil for determining oven baking conditions have been abandoned in favor of using standard linseed oil as a reference oil in order to facilitate work of the Core Test Committee. Sub-Committee on Core Strengths reports test results indicate a definite relationship between baked tensile strengths and absolute humidities and that both absolute humidity of incoming air and amount of water vapor in the oven are important. Work is continuing on this project.

Flowability Committee has developed a tentative test procedure that closely simulates conditions prevailing at the sand surface of a mold cavity during molding, squeezing or jolting. Grading and Fineness Committee plans to test the practicality of a newly-developed specific gravity balance method for determining grain size and distribution. Mold Surface Committee is continuing its work in developing a standard casting to be used for green sand testing for metal penetration. Other investigations have shown that silica flour additions are beneficial to both green sand and dry sand cores, and that time in mold, ramming, pressure, sand moisture and sand distribution affect metal penetration.

Committee 8-L reports steel test castings, after a slight modification in the scabbing test, corroborate results of last year's investigations. Experiments continue on development of a hot deformation recorder, which will be sent to Cornell University for tryout by A.F.S. researchers. Preparations are in progress for laboratory studies of mold surface behavior when exposed to radiated heat from liquid metal top surface during pouring. Sixth Edition of the FOUNDRY SAND TESTING HANDBOOK is undergoing final revision and is expected to be published this year. To date, no successor has been chosen to fill the vacancy created by the death of the late Dr. Heinrich Ries, longtime chairman of the Sand Division.

Steel Division. Division's 1951 Convention technical sessions and round table luncheon were very well attended. Research Committee is undertaking investigation of hot tears at Armour Research Foundation and has established dimensions and shape of a test piece whose response to hot tearing is measurable in terms of sand properties. Melting Methods Committee's plans to publish a collection of papers on steel melting which previously appeared in A.F.S. TRANSACTIONS, plus new articles on the subject, are expected to be completed in pamphlet form during the coming year.

Proposed is preparation of a pamphlet on statistical quality control as applied to making of steel, to be published by A.F.S. in the near future. Clyde B. Jenni, General Steel Castings Co., Eddystone, Pa., has been elected division chairman, replacing Charles Locke, Atlas Foundry & Machine Co., Tacoma, Wash. George W. Johnson, Vanadium Corp. of America, Chicago, is vice-chairman.

Foundry Cost Committee. Cost session at the Convention in Buffalo was well attended and the second session paper, *"A New Method of Evaluating Costs in Jobbing Foundries,"* aroused considerable discussion. Plans for the 1952 International Foundry Congress will be discussed in a meeting this fall. Several papers on foundry costs are currently being prepared for publication in AMERICAN FOUNDRYMAN. Ralph L. Lee, Grede Foundries, Inc., Milwaukee, continues as committee chairman.

Timestudy and Methods Committee. Session at the 1951 Convention drew good attendance and aroused lively discussion. Work on a proposed timestudy and methods symposium will be stepped up this year, but first it will be necessary to review papers presented in former years so that no valuable information will be overlooked. As tentatively planned, the symposium will cover typical timestudy applications in various foundry departments, recommended practices on various phases of timestudy and methods, and work simplification in the foundry. It is hoped that the committee will be able to enlarge its program from one to two sessions at the 1952 International Foundry Congress and to present speakers who will interest top management in this work. Milton E. Annich, American Brake Shoe Co.,

HARRY M. ST. JOHN
Chairman
PUBLICATIONS COMMITTEE

K. J. JACOBSON
Chairman
CHEMICAL ANALYSIS COMMITTEE

GEORGE J. BARKER
Chairman
EDUCATIONAL DIVISION

A. K. HIGGINS
Chairman
BRASS & BRONZE DIVISION

H F. TAYLOR
Chairman
FLUIDITY TESTING COMMITTEE

RALPH L. LEE
Chairman
FOUNDRY COST COMMITTEE

W. W. LEVI
Chairman
GRAY IRON DIVISION

H. A. SCHWARTZ
Chairman
HEAT TRANSFER COMMITTEE

Mahwah, N. J., replaces E. G. Tetzlaff, Pelton Steel Casting Co., Milwaukee, as chairman of the committee.

Plant & Plant Equipment Committee. Feature of the committee's two technical sessions at the 1951 A.F.S. Convention was the premiere of the film, *"Mechanization in Molding,"* produced by Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, which was enthusiastically received by the audience, as were the three papers on testing equipment and methods presented at the sessions. Plans are under way to present a symposium on molding equipment, and if possible to have another film on some other phase of foundry equipment, at the 1952 A.F.S. International Foundry Congress. A.F.S. National Director James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., continues as committee chairman.

Committee on Chemical Analysis. The committee has reviewed and checked 21 methods covering analysis for elements found in non-ferrous alloys. Colorimetric methods for determining nickel, iron, phosphorus, aluminum, copper, and bismuth were tested by two laboratories and will be further checked. Volumetric and gravimetric procedures for determining all of the elements in lead-base, nickel-silver, and copper-nickel alloys, brass and bronze, manganese and phosphorus bronzes have been submitted to the committee for test and comment. Research on polarigraphic procedures for zinc and cadmium are contemplated. K. J. Jacobson, Griffin Wheel Co., Chicago, continues as committee chairman. New committee member is Milton Sherman, Silverstein & Pinsof Co., Inc., Chicago.

Heat Transfer Committee. Substantial increase in interest in the work of the committee and its research project at Columbia University is reported. Past year's research covered *"Heat Flow of Moist Sand,"* and, subject to approval, the coming year's project will cover solidification rates and time-temperature history of "two-dimensional shapes." If time permits, the work will be expanded to include long, rectangular shapes and study of various side ratios. Dr. Harry A. Schwartz, National Malleable & Steel Castings Co., Cleveland, continues as chairman of the committee.

Also briefly reported were plans of the A.F.S. **Publications Committee,** by Chairman Harry M. St. John, Crane Co., Chicago, and of the **Refractories Committee,** by newly-elected chairman W. R. Jaeschke, Whiting Corp., Harvey, Ill.

Technical Correlation Committee members attending the meeting were:

Chairman Norman J. Dunbeck, Eastern Clay Products, Inc., Jackson, Ohio, *Aluminum & Magnesium Division*—Walter E. Sicha, Aluminum Co. of America,

E. T. KINDT
Chairman
PATTERN DIVISION

JAMES THOMSON
Chairman
PLANT & PLANT EQUIPMENT COMMITTEE

ROBERT NIEMAN
Chairman
PRECISION INVESTMENT CASTING COMMITTEE

HIRAM BROWN
Chairman
ALUMINUM & MAGNESIUM DIVISION

Cleveland; *Brass & Bronze Division*—George P. Halliwell, H. Kramer & Co., Chicago, and Bernard N. Ames, New York Naval Shipyard, Brooklyn; *Educational Division*—George J. Barker, University of Wisconsin; *Gray Iron Division*—J. S. Vanick, International Nickel Co., New York; W. W. Levi, Lynchburg Foundry Co., Radford, Va., and V. A. Crosby, Climax Molybdenum Co., Detroit; *Malleable Division*—Robert P. Schauss, Illinois Clay Products Co., Chicago, and W. D. McMillan, International Harvester Co., Chicago; *Steel Division*—Cyde B. Jenni, General Steel Castings Corp., Eddystone, Pa., and Charles Locke, Atlas Foundry & Machine Co., Tacoma, Wash.

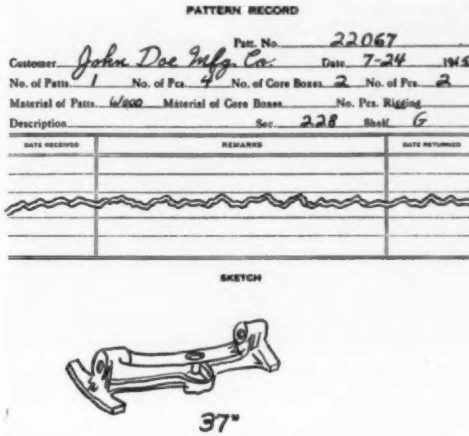
Chemical Analysis Committee—Karl J. Jacobson, Griffin Wheel Co., Chicago; *Foundry Costs Committee*—Ralph L. Lee, Grede Foundries, Inc., Milwaukee; *Plant & Plant Equipment Committee*—James Thomson, Continental Foundry & Machine Co., East Chicago, Ind.; *Publications Committee*—Harry M. St. John, Crane Co., Chicago; *Refractories Committee*—W. R. Jaeschke, Whiting Corp., Harvey, Ill.; and *Timestudy and Methods Committee*—Milton E. Annich, American Brake Shoe Co., Mahwah, N. J.

Unable to be present at the meeting were representatives of the A.F.S. Sand and Pattern Divisions, and the Precision Investment Casting, Heat Transfer, and Fluidity Testing Committees.

Also in attendance were A.F.S. National President Walton L. Woody, Technical Director S. C. Massari, Technical Assistant Jos. E. Foster and H. F. Scobie, editor, AMERICAN FOUNDRYMAN.

Records Show Location Of Patterns

This page from the pattern record book of Electric Steel Castings Co., Indianapolis, provides a means by which the foundry can tell at all times which patterns



PATTERN RECORD

Patt. No. 22067

Customer John Doe Mfg. Co. Date 7-24 1951

No. of Patts. 1 No. of Pcs. 4 No. of Core Boxes 2 No. of Pcs. 2

Material of Patts. Wood Material of Core Boxes No. Pcs. Rigging

Description Sec. 228 Shelf G

DATE RECEIVED	REMARKS	DATE RETURNED

SKETCH

37"

are in the plant and how to locate them when needed. Sketch at bottom of looseleaf page helps identify pattern and indicates special features of pattern not described under "Remarks."

Chapter Confers Posthumous Honor on the Late Dr. Heinrich Ries

More than a hundred members and guests of the A.F.S. Central New York Chapter gathered at Cornell University on April 13 to honor the late Dr. Heinrich Ries, longtime head of the A.F.S. Sand Division and internationally known geologist. Dr. Ries, who was to have received the plaque shown above personally, died just two days before its presentation, on the eve of his 80th birthday. Officers of the Chapter presented the plaque to members of Dr. Ries' family. Shown above are, from left, Chapter Secretary D. J. Merwin, Oriskany Malleable Iron Co., Utica; Chairman David Dudgeon, Jr., Utica Radiator Co., Utica; A.F.S. National Director Lloyd D. Wright, United States Radiator Corp., Geneva; and Chapter Vice-Chairman William D. Dunn of Oberdorfer Foundries, Inc., Syracuse, N. Y.

CAST STAINLESS STEEL IN CERAMIC MOLDS

H. Czyzewski*
R. L. Cook
P. Frederick
J. P. Jero

THE NEED for a mold material that will withstand the thermal shock of molten steel and produce sound castings of a high order of surface finish and fine detail prompted the investigation of various ceramic materials. This article deals with the characteristics of dry-pressed and fired ceramic molds for the casting of stainless steel. Five ceramic materials were tested in the preliminary survey.

A pattern was made for the casting of four tensile-test bars in each mold. The test-bar pattern included threaded sections to test the ability of the ceramic mold and the metal to reproduce such fine detail. Each mold consisted of two matched sections, mounted so that the parting plane was vertical during pouring. The two mold sections were held together with screw-type C-clamps.

The ceramic compositions are identified as follows:

Body 1—Fireclay Grog, composed of 50 per cent calcined fireclay and a blend of high grade fireclays.

Body 2—Steatite, composed of a high proportion of talc with 15 per cent clay.

Body 3—Cordierite, a special blend of talc, alumina and clay which is noted particularly for its low expansion characteristics.

Body 4—High Alumina, containing 75 per cent of pulverized tabular alumina, and the balance ball clays.

Body 5—Zircon Porcelain, containing a high proportion of ground zircon along with clay and complex alkaline earth zirconium silicates.

Each body contained 2½ per cent of gum-arabic binder, while the amount of water varied from 3¾ to 7½ per cent.

The bodies were "dry-pressed" at 80 tons pressure; the press cavity, which limited the size of the molds, was 9½x4¾ in., and the pressure was 3545 psi. After pressing the molds were dried overnight at a temperature of 300 F in a recirculating-air drier. The mold sections were then fired for 16 hr according to the schedule in Table I, which also includes a summary of the experiments with the different ceramic compositions.

All compositions withstood the thermal shock from the molten stainless steel. It was not possible to pour fine details such as the small threads more than once in these molds, but the detail was excellent in the first pour. The molds could be used more than one time if spring clamps rather than rigid clamps were used, and if the details of the mold were not too fine.

Preheating Ceramic Molds: The effects of mold preheating on the mechanical properties, surface appearance and dimensional accuracy of the as-cast tensile bars were observed, as well as the response of the ceramic molds. Only molds made of Body No. 1 were preheated. Table 2 summarizes some of these results.

The mechanical properties of the cast bars dropped to an unsatisfactory level only for those cast in molds preheated to 1000 F. These low properties are attributed to porosity from entrapped gas. This porosity was excessive only in those bars cast into the molds with the highest preheat. All of the test bars had dendritic grain structures; the bars produced in the 1000 F preheat molds had grain sizes approximately six times those of the bars cast into unheated molds.

Dimensional sketch of the stainless steel test bar casting. The fine threads were reproduced successfully.

The mold preheat temperature had only a slight effect on the surface appearance of the as-cast test bars. The lower the mold preheat temperature, the rougher and lighter in color was the oxide scale on the tensile bars. All bars possessed a bright smooth surface when lightly sand blasted to remove the scale. However, there was a considerable effect of mold preheat temperature on the accuracy of reproduction of fine detail. As could be expected, the molds at the higher preheat temperature provided greater metal fluidity and the thread details and casting dimensions

TABLE I—CHARACTERISTICS OF THE CERAMIC MOLDS

Body	Ease of Pressing, (A-easiest E-hardest)	Firing Schedule, (Cone No.)	Linear Shrinkage, %	Casting Surface Finish	Metal Attack on Mold**
1	C	6	2.60	Rough	High
2	D	9	4.34	Fair	Medium
		11	4.40		
		14	4.46		
3	B	9	1.75	Fair	Medium
		11	1.77		
		14	1.78		
4	A	14	0.39	Good	Very Low
		15	—1.235*		
		20†	—1.706*		
5	E	9	4.44	Good	Very Low
		11	5.13		
		14	5.94		

* Growth
** Molds were at room temperature prior to casting.
† Mold surface rough on firing, no casting attempted.

*The authors are: assistant professor, physical metallurgy, University of Illinois; professor, ceramic engineering, University of Illinois; U. S. Army Air Force; and Caterpillar Tractor Co., Peoria, Ill., respectively.

Pressed and fired ceramic molds produced stainless steel test bars of good finish, fine detail, and dimensional accuracy. This article describes the methods and ceramic compositions used, the poured mold characteristics and test bar properties obtained in the preliminary experiments, and the effects of mold preheating. A high alumina-ball clay mixture appeared to be the most satisfactory of the five ceramic compositions tested.

TABLE 2—MECHANICAL PROPERTIES OF AN INDUCTION-FURNACE HEAT OF 18-8 STAINLESS STEEL AS FUNCTIONS OF MOLD-PREHEAT TEMPERATURE

Mold-Preheat Temp., F	Ultimate Tensile Strength, psi	Yield Point, psi	Reduction of Area, %	Percent Elongation, 1-in gage, %
Room Temp.	84,500	47,800	27.8	42.5
	86,700	53,500	23.9	27.0
300	83,400	50,200	29.1	41.0
300	72,000	50,200	25.3	27.0
600	79,800	52,100	25.4	20.0
600	80,800	52,200	34.9	29.0
1000	70,000	47,400	27.2	19.0
1000	71,000	48,400	36.0	26.0

were reproduced more accurately. This again is most significant in the thinner sections and finer detail.

Conclusions

The survey experiments indicate that dry-pressed-and-fired ceramic molds can be prepared which will produce castings of satisfactory mechanical properties and superior surface finish. Some of the molds may be reusable, making semi-permanent type molds for steel casting. A special attribute of Body 3 is its almost constant shrinkage over a firing range of five cones. Body 4 appears to be the best all-around ceramic material tested, and it also presents the possibility of obtaining zero shrinkage if firing temperature is very accurately controlled (at about Cone 14½). In addition there is a distinct possibility that with slight adjustment in composition and firing sequence, Body 4 can be made to expand upon firing exactly the amount needed to compensate for metal shrinkage in the casting. This would permit some finished metal parts to serve as their own patterns.

These preliminary experiments show some of the desirable characteristics of ceramic molds for the casting of steel. However, further development is needed before the method can be converted to practice.

Ten-Ton Mold Produces Largest Aluminum Permanent Mold Casting

CLAIMED TO BE LARGEST ever produced, a 500-lb. permanent mold aluminum casting has been produced by the John Harsch Bronze & Foundry Co., Cleveland, using a cast iron mold weighing nearly 10 tons.

The company originally began casting the part in sand, but because of the size of the unit, the operation required four days in the foundry and the use of a large sand slinger to prepare the molds. Seven men could produce only four units a day and it was found that to develop the required strength in the cast metal, the entire inner surface of the unit had to be chilled. Accomplishing this in the sand casting required a large number of iron chills placed close together in the mold and the resulting surface was difficult to machine.

Since sand casting of the part was costly and impractical, the company constructed a mold of high-grade cast iron weighing nearly 10 tons and measuring 65 in. high and 46 in. in diameter. The mold was made of hinged sections riding on rollers to facilitate opening and closing. Rows of gas burners surrounded the mold to maintain it at a uniform temperature for optimum pouring conditions.

According to company officials, the permanent mold casting has a higher strength than that of sand castings, is easier to machine, requires only one day in the foundry and four men can produce 12 units a day, as contrasted to the need for seven men to produce four units a day by sand casting.

Future Meetings and Exhibits

SAND SCHOOL, Harry W. Dietert Co., at Engrg. Soc. of Detroit Auditorium, Detroit, Aug. 20-22.

INSTRUMENT SOCIETY OF AMERICA, national conference and exhibit, Sam Houston Coliseum, Houston, Texas, Sept. 10-14, 1951.

INTERNATIONAL FOUNDRY CONGRESS, Brussels, Belgium, Sept. 10-14.

NATIONAL METAL TRADES ASSOCIATION, 52nd annual convention, Palmer House, Chicago, Sept. 26-28.

GERMAN FOUNDRYMEN'S SOCIETY, 42nd general meeting, Dusseldorf, Germany, Sept. 28-29.

MICHIGAN REGIONAL FOUNDRY CONFERENCE, sponsored by A.F.S. Detroit, Central Michigan, Saginaw Valley, Western Michigan Chapters, and Michigan State College Student Chapter, at Michigan State College, East Lansing, Mich., Oct. 11-12.

TEXAS REGIONAL FOUNDRY CONFERENCE, sponsored by A.F.S. Texas Chapter, and Texas A. & M. Student Chapter, Shamrock Hotel, Houston, Texas, Oct. 19-20.

METALS CASTING CONFERENCE, sponsored by A.F.S. Central Indiana and Michiana Chapters, and Purdue University, at Purdue, West Lafayette, Ind., Nov. 1-2.

QUAD CITY REGIONAL FOUNDRY CONFERENCE, sponsored by A.F.S. Quad City Chapter, Blackhawk Hotel, Davenport, Iowa, Nov. 8-9.

SPANISH IRON & STEEL INSTITUTE, 2nd general assembly, Madrid, Spain, Dec. 10-15.

MODERN FOUNDRY METHODS...

PLANNING MECHANIZATION FOR MEDIUM-SIZE GRAY IRON FOUNDRIES

Production and material handling equipment and layouts for coreroom, molding, and melting sections in medium-size gray iron foundries are extensively treated by the author, Henry W. Zimnawoda, National Engineering Co., Chicago, in the 1951 A.F.S. exchange paper to the French Foundry Technical Association. Some typical sand, core, and mold handling arrangements are presented in this section. The complete paper will appear in the 1951 A.F.S. TRANSACTIONS, vol. 59.

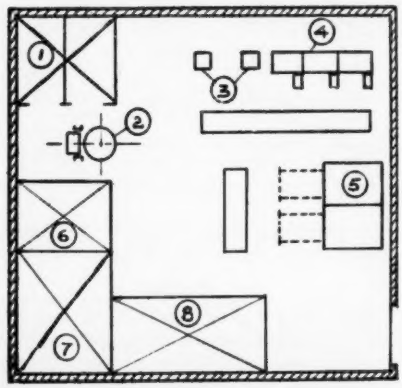
The secret of production in each foundry section lies in reducing variables to a minimum. This can be accomplished by controlled sand preparation for cores and molds, reliable core baking ovens, controlled melting methods, and adequate hot metal handling systems. The gray iron jobbing foundries melting 20 to 30 tons per day represent a large segment of the foundry industry in need of modernization of production methods.

Economy of coreroom operation depends upon location in relation to other departments, selection of proper equipment and arrangement of units according to the flow of materials or sequence of operations. Mechanical equipment, supplemented when necessary by unskilled labor, will relieve the skilled coremakers of time-consuming and unproductive activities. Mechanical handling of finished cores will save time and labor, and ease of movement will eliminate core distortion and breakage.

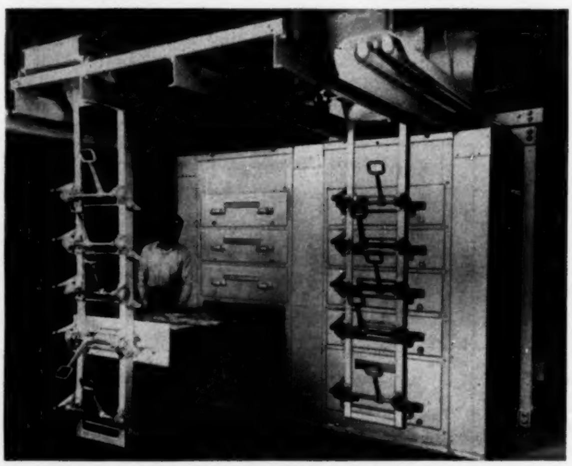
It is desirable that the grain size of core sand be comparable to that of the system sand, so that cores broken up in shakeout operation will not appreciably affect the permeability of prepared molding sand. This sand should also be free from moisture, and if delivered wet should be dried in an oven.

Mixers for core sand fall into two groups: (1) blade (paddle or sigma-type); and (2) muller-type mixers. The first type consists either of a trough with a revolving shaft and mounted paddles or two sigma-shaped shafts. These mixers are used for small batches and are charged by hand; they are effective for oil binders. Muller-type mixers are built for larger capacities. They provide better distribution of ingredients, especially colloidal-type binders, and develop better green strength of prepared sand. These mixers consist of a circular crib with two revolving mullers, and usually are equipped with bucket loaders for charging.

Manual handling of prepared sand can be replaced by the installation of the mixer on a platform. In this arrangement the dry sand is shoveled from storage into a bucket of the loader, where the bonding additions are made. The prepared sand is distributed on the platform by dumping the contents from a rubber-wheeled buggy into the coremaker's hoppers suspended from the platform.



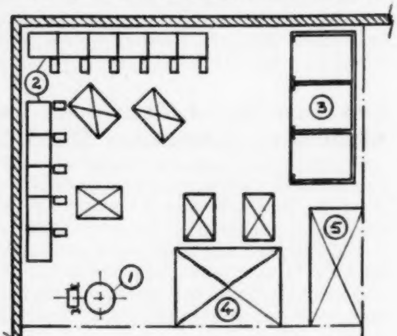
Coreroom layout: (1) sand storage; (2) mixer and bucket loader; (3) core blowers; (4) core benches; (5) drawer-type ovens; (6) core inspection; (7) core box storage; (8) finished core storage.



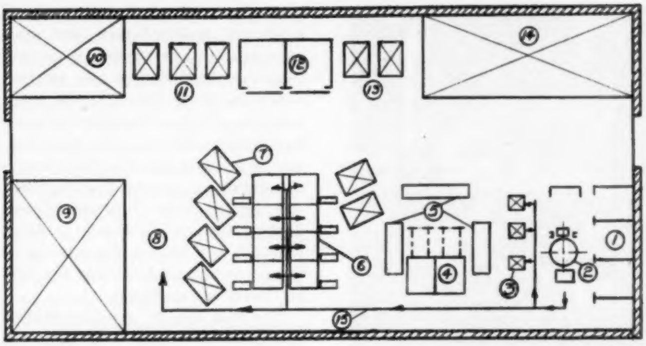
Drawer-type oven is especially suitable for baking small, intricate cores.

Racks are loaded by coremakers at working stations and moved by truck into rack-type oven.

Coreroom layout: (1) mixer and bucket loader; (2) core benches; (3) rack-type ovens; (4) core finishing; (5) core storage.

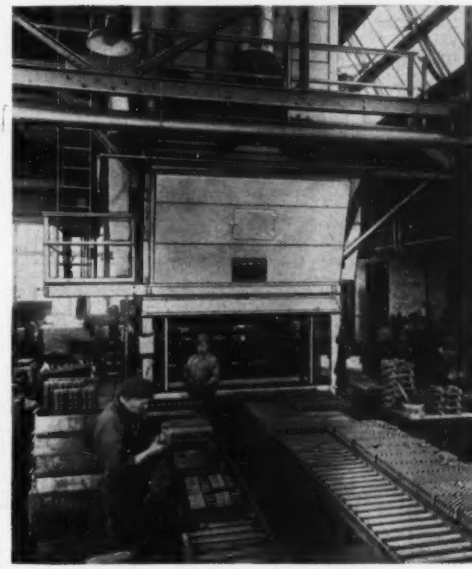


...MODERN FOUNDRY METHODS



Coreroom layout: (1) sand storage; (2) sand preparing unit; (3) core blowers; (4) drawer-type ovens; (5) tables; (6) core benches; (7) core racks; (8) space for special cores; (9) core storage; (10) finishing and inspection; (11) cooling; (12) rack-type ovens; (13) empty racks; (14) core box storage; (15) prepared sand delivery to blowers and benches.

Vertical conveyor-type oven commonly used for baking cores of approximately the same size.

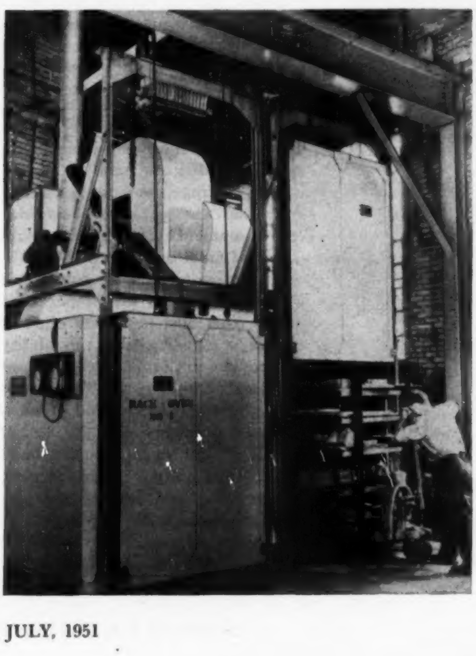


It can be also discharged into a holding hopper for use by floor coremakers or for distribution to small core blowers.

Another method of core sand distribution is by monorail carrier, which stops in front of the mixer, lowering a bottom-drop bucket under the discharge chute. When filled the bucket is hoisted to the transporting position and stopped at the coremaker's stations to refill the hoppers.

Drawer-type ovens are used for baking small cores. Within the oven the drawers are supported by rollers which assure a smooth movement without danger of breaking small, intricate cores.

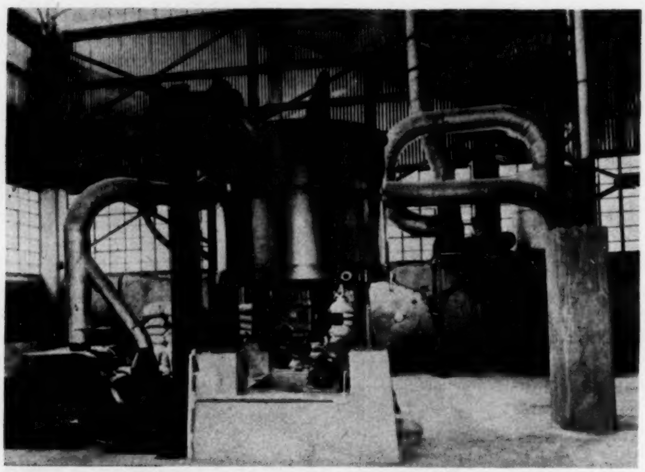
Rack-type ovens were developed to reduce the cost of transportation of larger cores by the use of portable racks of the average size 4x6 ft (usually with 5 shelves) and a capacity of 1 to 2 tons. The racks are loaded by coremakers at their working stations, and moved by hand- or power-operated trucks into the oven.



Vertical conveyor ovens are commonly used in foundries where the manufacturing program is established and the cores are of approximately the same size. It is not unusual, however, for vertical conveyor ovens to be used in jobbing shops where a variety of core shapes and sizes must be baked.

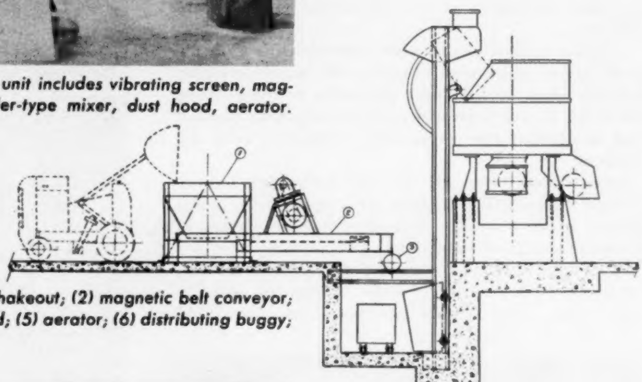
Among the major advantages of the vertical core oven are its continuous operation and the minimum floor space required. The bench coremakers and the core blower operators usually are grouped around the upgoing section of the conveyor. A passageway through the middle of the oven provides for convenient access to both sides of the ascending shelves, allowing oven unloading and eliminating congestion at the loading station.

MODERN FOUNDRY METHODS...

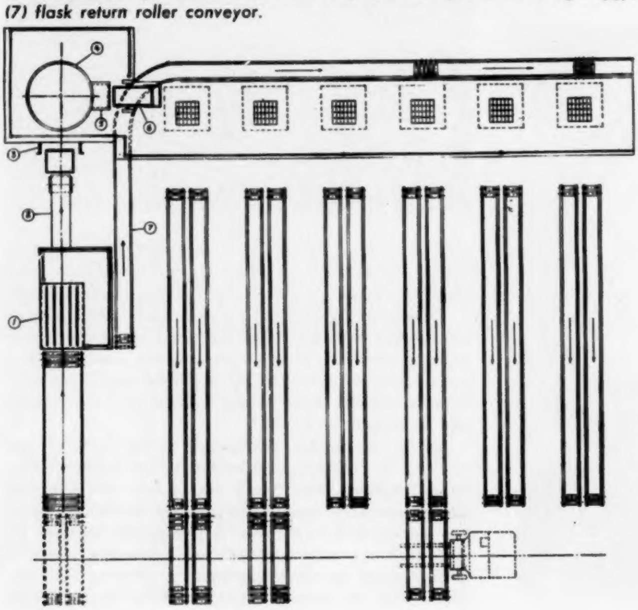


⬆ *Complete molding sand preparation unit includes vibrating screen, magnetic belt conveyor, bucket loader, muller-type mixer, dust hood, aerator.*

Molding sand handling system: ➡ *(1) holding hopper; (2) vibrating screen feeder; (3) magnetic pulley.*



⬇ *Sand handling layout: (1) vibrating shakeout; (2) magnetic belt conveyor; (3) bucket loader; (4) mixer with dust hood; (5) aerator; (6) distributing buggy; (7) flask return roller conveyor.*



Handling of used and prepared sand and molds before and after pouring are the most important functions contributing to efficient operation of the foundry. The right selection of proper mechanical units and layout will reduce the total volume of sand needed and the quantity of molding equipment. Proper layout will also allow for increase of production with no increase in building space. It will reduce the number of scrap castings and provide for better working conditions.

The first step in a modernization program is to employ a molding sand preparation method which will insure uniformity of each batch of prepared sand. The next stage should deal with the mechanical conveying system for shakeout sand, its cleaning and storage, and the last modernization change should consider the equipment used to distribute prepared sand and handling molds.

Many factors must be considered in the selection of the proper sand mixer. The most important characteristic of a good mixer is its ability to provide uniform distribution of bonding materials and moisture throughout the batch. The production per hour and cost per ton of prepared sand, figured on the basis of operating costs including repairs, maintenance, and power consumption, should also be considered. . .

Efficient operation of the mixer depends upon its auxiliary equipment for automatic charging of

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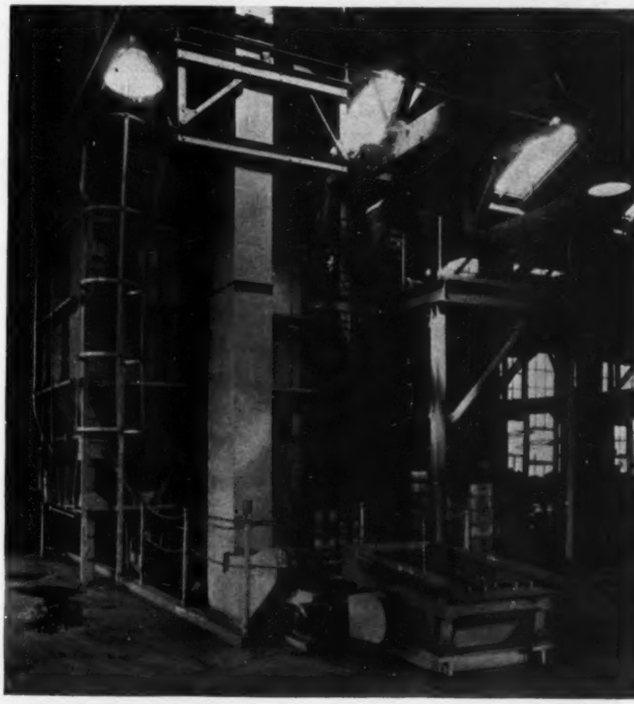
screened sand cleaned of magnetic refuse. One of the photographs shows a sand preparation arrangement. It consists of a vibrating screen with magnetic belt conveyor running underneath, a bucket loader for charging the mixer, the muller-type mixer with dust hood connected with the dust collecting system, and an aerator for fluffing of discharged prepared sand. The mixer's drive is located underneath, and the concrete pedestals are constructed to suit the required discharge height.

A more developed sand preparation system consists of a holding hopper which can be filled by a special truck, or by a box suspended from an overhead crane. The hopper feeds the sand through the regulating gate into a vibrating feeder. This feeder is a two-level unit; it has a perforated top for removal of oversize scrap and core butts, and allows usable molding sand to pass through the perforation onto the lower deck of the vibrating trough. The screened sand is passed over a magnetic pulley for removal of metallic impurities, and then discharged into the bucket of the loader.

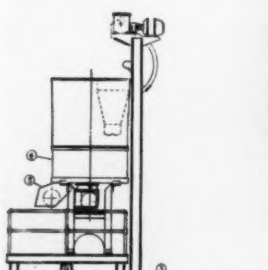
One of the layouts shown comprises a complete system for handling sand and molds. The arrangement does not require pits or special foundations, and can be installed in almost any building. Conventional roller conveyors are used for the storage and pouring of molds.

The cooled molds are pushed onto the transfer section of the roller conveyor, which is then picked up by a monorail hoist or lift truck and carried to the end of the foundry. An operator on the elevated platform moves the molds to the vibrating shakeout while the truck operator goes back for another load.

The sand passes through the shakeout bars onto the magnetic belt conveyor to be delivered to the bucket loader. The castings are delivered by means of a chute to a container on the floor, and the empty flasks are returned on the roller conveyor line to the molding stations.



Sand handling arrangement includes vibrating shakeout, elevator, storage bin, measuring hopper, bucket loader, mixer with dust hood, distributing platform and molder's hopper.



Elevation of sand handling layout shown on opposite page: (1) vibrating shakeout; (2) magnetic belt conveyor; (3) bucket loader; (4) mixer with dust hood; (5) aerator. The photograph shows a lift truck about to move poured molds to position for elevating to shakeout level.

MODERN FOUNDRY METHODS...

The melting section of the gray iron foundry offers numerous opportunities for mechanization. Handling of raw materials in the yard, mechanical charging of the furnaces, application of auxiliary equipment for controlled melting, and use of modern pouring units will contribute to the economy and efficiency of foundry operation.

Handling of raw materials starts in the yard when cars of scrap, pig iron, coke and limestone are delivered. The crane, equipped with magnet and clam-shell bucket, will perform the unloading at much less cost and time than the manual operation.

Cupolas today are essentially the same as those built in the early days of the gray iron foundry. Elimination of hand charging is made possible by mechanical charging equipment. A properly designed charging system will pay for itself in a short time through reduction in labor, savings in materials, and elimination of the charging platform.

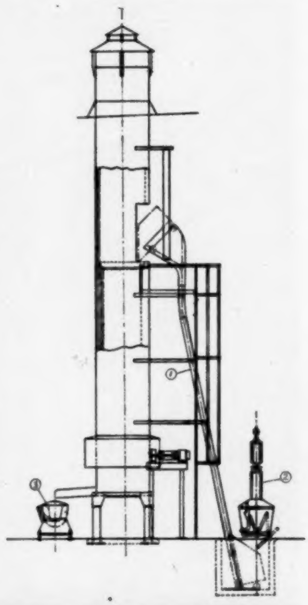
The mechanical charger simplifies the material-handling problem since coke, iron and limestone are put into the same bucket. It also improves melting practice by allowing the raising of the cupola charging door, increasing the height of the charge above the melting zone.

Such an arrangement permits preheating of larger amounts of iron, gives greater melting speed and hotter metal since the charge receives full benefit of the fuel.

Cupola chargers are either skip hoist or crane type. The size of the unit and the selection of the right type depends upon many factors such as yard space, size and number of cupolas, scrap available, etc.

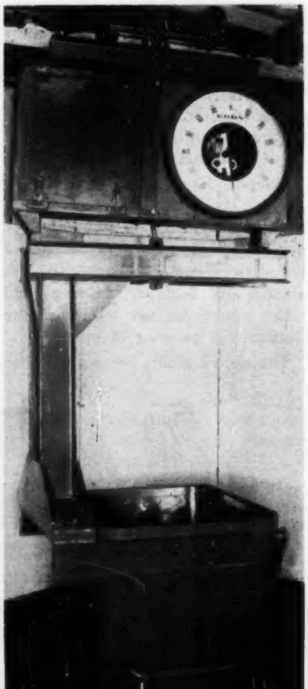
The skip-hoist charger is of inexpensive design, simple in operation and particularly suited for the small or medium-size foundry. The bucket is raised and lowered by a cable attached to an electric hoist. It is mounted on wheels for travel on vertical track, curved at the top.

The monorail type weigh lorry with bottom-dump bucket is pushed by the operator along the monorail loop, loading the required amount of scrap, pig iron, coke and lime-



Charging arrangement for cupola: (1) skip charger; (2) weigh lorry; (3) holding U-ladle.

Weigh lorry with bottom-dump bucket is pushed along monorail loop for loading with weighed amounts of scrap, pig iron, coke, and limestone.



Handling and charging equipment for the foundry material yard includes charging crane with magnet and clamshell buckets, and hopper storage bin for coke and limestone.

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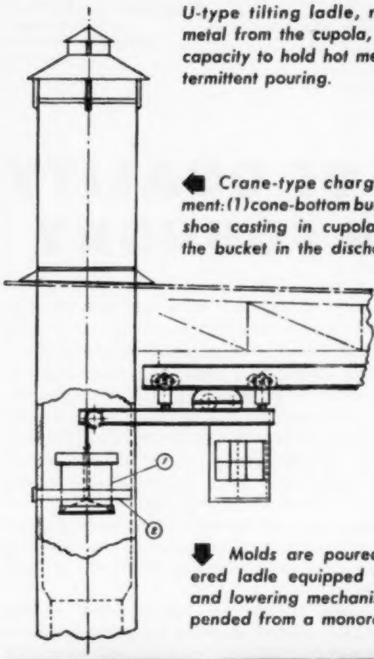
U-type tilting ladle, receiving metal from the cupola, has sufficient capacity to hold hot metal during intermittent pouring.

Crane-type charging arrangement: (1) cone-bottom bucket; (2) horseshoe casting in cupola which holds the bucket in the discharge position.



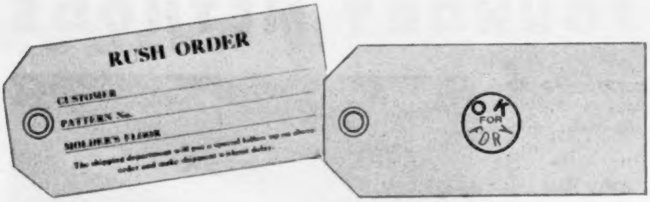
Molds are poured from covered ladle equipped with raising and lowering mechanism and suspended from a monorail system.

stone into a bucket on the lorry. After bringing the loaded lorry into a position above the skip-hoist bucket, the operator releases the charge by hand lever.

The most popular form of bucket for a crane-type charger has a cone-shaped bottom which is attached to a center stem suspended from the hoisting mechanism. A horse-shoe casting, which holds the bucket in the discharging position, is located in the cupola stack. It serves to support the shell of the bucket while the bottom is lowered and the material is discharged.

Metal melted in the cupola usually is received in a U-type tilting ladle, or directly into larger ladles to be transferred in the pouring ladles at the hot metal distribution point. The U-ladle is heavily lined with refractory, and has sufficient capacity to serve as a reservoir of hot metal during intermittent pouring.

Molds are poured from covered ladles, equipped with raising and lowering mechanism and suspended from a monorail. This type of ladle makes it possible for one man to do the job of pouring.



Alexander D. Barczak
Plant Manager
Superior Foundry, Inc.
Cleveland

RECORDS ARE BASIS OF QUALITY CONTROL IN SMALLER FOUNDRY

Engineering specifications for improved properties in gray iron castings place great responsibility on producing foundries for adequate control methods to fulfill the requirements of the consumers' designs.

Foundrymen, over 50 years ago, appreciated the necessity for the application of science and control in the foundry, and this led to the founding of the American Foundrymen's Society for the accumulation and dissemination of knowledge to the industry.

Quality casting production cannot be guaranteed without the help of chemical, mechanical, and sand laboratories. Whether these are an integral part of the foundry, or commercial laboratories are to be used, becomes a problem in economics which must be solved by the smaller foundry. Through the use of these laboratories and concise recording of the results obtained for daily comparisons, one is able to evaluate foundry progress and meet specifications more consistently.

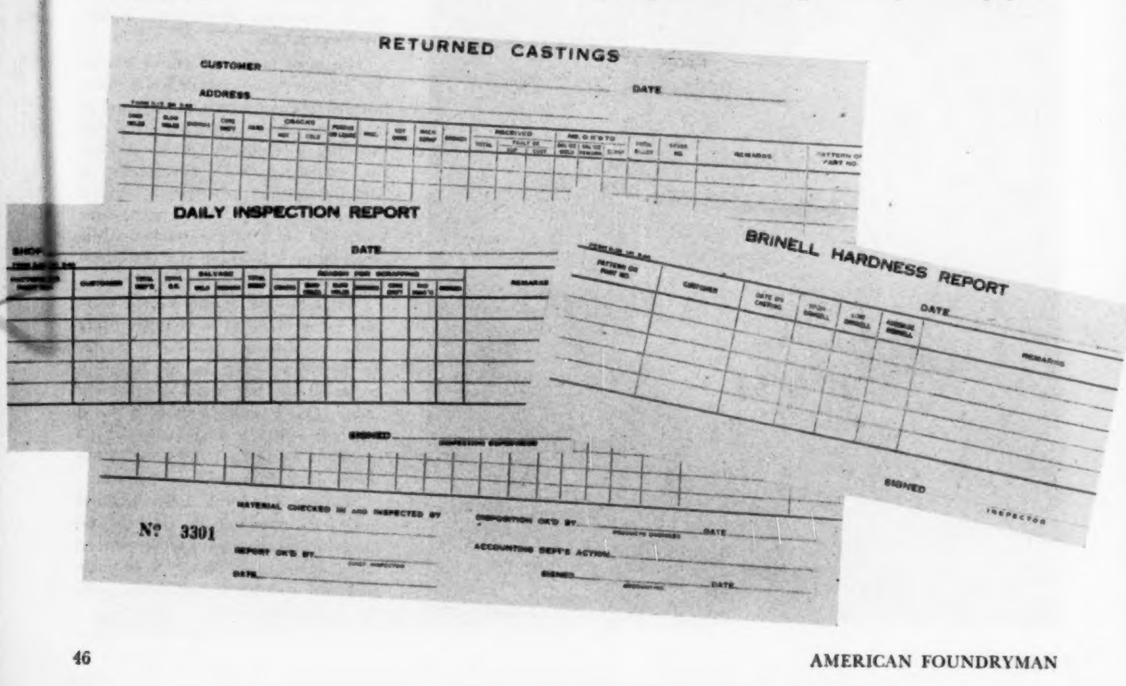
The controls and tests that have been employed in the large automotive foundries for the past 20 years speak for themselves in the outstanding performance of the modern automobile, truck, and diesel engines.

The consistency of top quality gray iron production by these foundries and the controls that are used make a reliable pattern to be followed by the smaller foundries. Although it is true that the small foundry cannot afford the elaborate laboratory techniques and testing facilities of the large automotive foundry, there are certain essential control features that can be carried out at a minimum cost that will assist the foundryman in producing top-quality castings, even on a small daily tonnage.

The following outline will explain the various phases of quality control that can be administered in the small foundry:

I. **Pattern Preparation:** (a) The production department places various tags on the pattern equipment

Note: This paper was presented at the 1950 Ohio Regional Foundry Conference, sponsored by the five A.F.S. Ohio Chapters, at Cincinnati, Ohio.



such as "rush order, special order, regular monthly order," etc. The equipment is removed from pattern storage to the pattern preparation department where a complete check is made of the condition of the pattern; pins and bushings; gating and risers, etc. After a thorough examination by the superintendent and foreman and subsequent approval an "OK for Foundry" is stamped on the reverse side of the various tags. No patterns are allowed to be placed into production without this approval stamp.

(b) Jobs running continuously are checked each night by pattern changers for visual discrepancies.

II. Core Sands: (a) Test all raw materials on arrival of each shipment to determine whether in desired specification range; (1) lake sand; (2) bank sand; (3) core oil; (4) cereal binder.

(b) All materials mixed according to definite formula by exact weight—water meters also used.

(c) Core boxes and driers checked for wear at end of each production run.

(d) All cores baked according to definite prescribed time and automatic temperature control.

(e) Core sand tests made in sand laboratory daily on each type mix; (1) moisture; (2) green strength; (3) dry permeability; (4) baked tensile strength; (5) hardness.

(f) All blackened cores must be redried at 230 F before delivery to foundry.

(g) All cores delivered to foundry are given visual inspection before loading.

III. Molding Sands: (a) Test all raw materials on arrival of each shipment to determine whether in desired specification range; (1) lake sand; (2) bank sand; (3) bentonites; (4) sea coal; (5) wood flour.

(b) All materials mixed according to definite weight formula—water meters used.

(c) Molding sand tests made hourly in sand laboratory; (1) moisture; (2) permeability; (3) green strength; (4) per cent combustibles.

(d) Modification of molding sand mixtures to conform to prescribed limits under jurisdiction of chief metallurgist.

(e) Mold hardness checked daily on all jobs by molding foremen through use of mold hardness tester.

IV. Iron: (a) Raw materials tested in chemical laboratory for confirmation to specifications; (1) pig iron; (2) silvery pig iron; (3) steel; (4) purchased scrap.

(b) Raw materials checked visually for size and structure—supplier furnishing chemical analysis with each shipment; (1) coke; (2) limestone; (3) special flux; (4) alloys.

(c) All metal charges weighed in accordance with formula made up by plant manager—no deviation permitted.

(d) Chief metallurgist allowed to vary silvery pig iron according to laboratory results on silicon.

(e) Chill tests taken at spout every 15 min.

(f) Hourly tests made; (1) total carbon; (2) silicon; (3) chill depth; (4) temperature; (5) blast pressure.

(g) Daily tests made on one hourly sample; (1) total carbon; (2) silicon; (3) manganese; (4) phosphorus; (5) sulphur; (6) chill depth; (7) temperature; (8) blast pressure; (9) tensile strength; (10) transverse; (11) deflection; (12) Brinell hardness; (13) impact.

(h) Special alloy irons tested whenever required to check content percentage; (1) nickel; (2) chromium; (3) molydenum; (4) manganese; (5) copper.

(i) Brinell hardness checked daily on at least one type of casting produced in each department.

(j) All chill tests and test bars made according to A.S.T.M. or G.I.R.I. specifications.

(k) Chemical laboratory and sand laboratory accu-

racy checked every 3 months with all other members of Gray Iron Research Institute, or a similar organization.

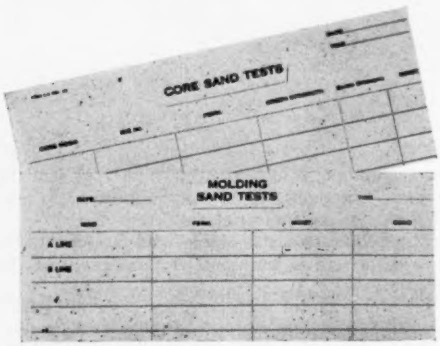
V. Inspection: (a) Samples of daily production are cleaned every hour and delivered to central location in foundry for molders' and foremen's observation. (1) Casting defects observed here: (a) crushes; (b) scabs and buckles; (c) swells; (d) mismatch; (e) misplaced cores; (f) misruns; (g) poured short; (h) shrinks.

(b) Rough visual inspection is made after castings come out of cleaning department (defects observed same as in VI.)

(c) Final inspection made as castings are delivered to shipping department; (1) casting general appearance; (2) dimensional check; (3) pressure test; (4) Brinell hardness.

(d) Non-destructive tests such as x-ray for casting soundness made at customer's request.

(e) Destructive tests such as sectioning to determine soundness made at discretion of chief inspector.



(f) Casting passing final inspection marked by inspectors' individual number for future reference.

VI. Scrap Control: All castings produced in one day must be cleaned, sorted and rough inspected by end of following day.

(b) All castings produced must be accounted for daily by payroll department.

(c) All scrap castings must be delivered to discount department: (1) scrap must be sorted and classified by department and defect; (2) foremen and employees must check out their scrap; (3) scrap record must be turned in to payroll department promptly; (4) copies of scrap record are posted in each department daily.

(d) Graphical scrap notice is posted daily in offices for foremen's and management's observation: (1) departmental scrap; (2) total shop scrap; (3) previous month's average scrap.

Over-all dimensions are checked on each intake manifold with templates, and ball bearings are run through all pipe openings. This is done in final inspection. Over-all dimensions are checked on each bearing cap and clutch housing with templates in the final inspection. Over-all dimensions and warpage are checked on every cover in final inspection. Exhaust manifolds are given a visual inspection with extra care to note excessive grinding of clamping lugs.

All returned scrap from each customer is carefully examined and recorded by the chief inspector. This scrap is then delivered to the discount room for inspection by the foremen and employees. After they have gone over it, the material is delivered to the cupola department for remelting.

A record is kept on a percentage basis of all casting returns from each customer, and a comparison is made each month to ascertain the progress being made toward improving the quality. Graphs are employed wherever possible to plot the course of all the variables, deviation from range, and daily trends.

Summary

1. The control forms reproduced here—tags for pattern release to production; returned castings report showing causes for rejection; daily inspection report classifying reasons for scrap; hardness report; daily metal control report covering analysis, physical tests, alloy additions and types of castings poured; core sand tests; and molding sand tests—are tools for control. Additional control forms in use include:

(a) Melting report covering number and kind of charges for each cupola, coke and materials used, labor, yields, and operating times and conditions.

(b) Molding sand control report which shows types of sand and where used, carbon content, permeability, moisture, bond, and any special tests.

(c) Daily foundry scrap report classifying the scrap as due to molding, pouring, cores, supervision, and breakage due to shakeout, cleaning, grinding and handling.

2. The staff and people in charge must have sufficient training, both practical and technical, to interpret the results obtained.

3. They must have the ability to diagnose the problem correctly and apply the proper remedies at once.

4. Small foundries can utilize outside assistance in insisting on warranted analysis on materials purchased. Valuable information can also be obtained by the small foundry by working with customers who will furnish data on chemical and physical results obtained daily on castings shipped to them.

5. The assimilation of test results into graphical projections in one central office will assist the staff a great deal in recognizing the trends of the variables and permit the necessary adjustments with the least delay. This is the core of quality control.

6. Quality control tests results reflect themselves not only in the improved casting delivered to the customer but also in profits and increased output. The scrap casting is the most expensive casting made in the foundry and, of course, the ultimate goal is to furnish the customer with all good castings. It becomes apparent that the most certain way of approaching perfection is to establish standard procedures for each operation in the foundry and maintain these standards through constant testing, checking and correlation. Accurate recording of daily achievements is the only means a foundryman has of determining whether the trend is away from or toward the goal of furnishing the customer with quality gray iron castings.

References

1. F. J. Walls "Quality Control Review," American Foundryman, Nov. 1949, p. 51.

2. Harry B. Swan "Pursuing the Quality Ingredient," *The Foundry*, Dec. 1949, p. 78.

OUTLINE INDUSTRIAL TRUCK PREVENTIVE MAINTENANCE PROGRAM

FOURTEEN WAYS to lower operating costs of electric industrial trucks are outlined below by Charles Greener, Automatic Transportation Co., Chicago. Planned preventive maintenance assures reduced service budgets, longer truck life, and less down time. The program, for one-truck or fleet operations includes these recommendations:

1. Loads should suit the truck. Teach operators that truck capacity varies with load length, and that continual overloading causes serious breakdowns and increases tire bills. Use trucks with ample reserve capacity.

2. Keep floors clean and in good condition. Poor surfaces cause damaging strains and shocks, and short tire life.

3. Replace tires when they develop flat spots or when big chunks of rubber are gouged out. Stretching tire use damages the trucks, increases repair costs, and is bad for driver health and efficiency.

4. Only the mechanic should do repair work. The operator should call the mechanic, and the truck should not be pushed or towed without the mechanic's orders.

5. Operators should be trained thoroughly in proper use of equipment. Wherever possible, each man should work permanently with the same truck.

6. Obtain full information about a new truck. The manufacturer's service representative should demonstrate it for the operators, advise the maintenance force, explain spare parts needs, and make sure no damage was incurred in shipment.

7. Mechanical maintenance programs, large or small, should follow a regular schedule. A series of mechanical worksheets or tags should prescribe services to be performed. A fleet maintenance record will show the life expectancy of important units. This enables necessary changes to be made in advance to avoid complete breakdown and prevent loss of operating time.

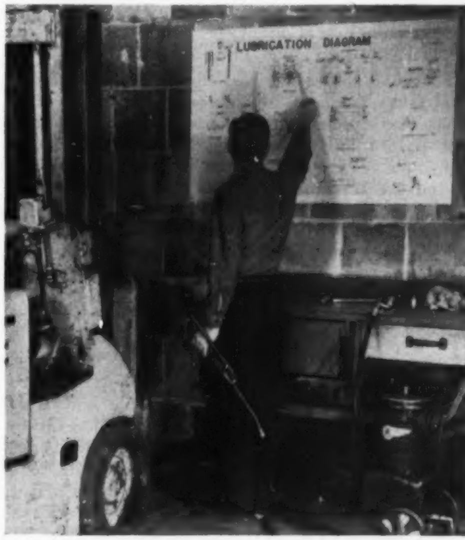
8. Trucks need a monthly lubrication and mechanical check, usually requiring about 1½ hr, which should follow removal of dirt and grit from the undercarriage. Fleet operation calls for a cleaning rack in a small room or enclosed area. A weak alkaline solution applied under steam pressure does a good cleaning job, and compressed air is best for drying. After the mechanical check the truck is lubricated. A large blow-up of the manufacturer's lubrication chart enables the maintenance to follow it easily. During the check the truck should be put through its paces thoroughly in all speeds, and with a normal load.

9. Semi-annual mechanical checks and lubrication are more extensive. Included are cleaning and repacking wheel bearings, changing drive axle grease or oil, and any other services not assigned to the short-term checkups.

10. Electrical checks should be conducted on a weekly, monthly, and semi-annual basis. The weekly check includes tightening loose fittings and replacing worn or damaged parts. Monthly, all electrical operations should be observed closely, and semi-annually, the complete electrical inspection will save money. Tightness of electrical connections and proper insulation of wires should be noted carefully.

11. Batteries require careful attention. Overwatering will weaken the electrolyte, and when it spills over from the battery case, the electrolyte causes corrosion of other truck parts. Flushing the battery should be part of the weekly inspection. Automatic charging equipment should be properly maintained.

12. General overhauls should be scheduled according to operating conditions, such as the number of hours the truck works daily, plant conditions, and the driver's ability.



Following a planned procedure, the maintenance man checks enlarged copy of manufacturer's instruction chart to make sure that truck is lubricated properly.

13. A weekly log for each truck, on which is recorded inspections, lubrications, and cleanings, will indicate that necessary preventive maintenance functions are performed.

14. The program outlined is based on one shift a day, and favorable operating conditions. Under rough conditions, such as poor floors, more than average dirt, or more than one shift a day duty, trucks require more frequent use of some or all of these checks.

Truck users should treat preventive maintenance as a money-saving part of operations. Properly conducted, it will show which operators are not doing their jobs well, which trucks are assigned to jobs for which they are not fitted, and what changes can be made in truck design to improve their utility.

The present production emergency and material restrictions will make trucks and parts harder to obtain—an added incentive for preventive maintenance.

Chapter Sponsors Session On PLANT SAFETY At Philadelphia Conference

INDUSTRIAL SAFETY in its most important phases was the subject of a safety session held by the A.F.S. Philadelphia Chapter during the 17th Annual Philadelphia Safety and Fire Conference and Exhibit at the Bellevue-Stratford Hotel, Philadelphia.

Feature of the session was a five-man panel on industrial safety practices. Moderator for the panel of experts, who represented such varied industries as foundries, an insurance company and a food processing company, was Charles O. Butler of the Florence Pipe Foundry & Machine Co., Florence, N. J. Panel members were Thomas H. Bullard, The Budd Co., Bustleton, Pa.; Elmer Huteley, Campbell Soup Co., Camden, N. J.; Earle Layman, General Steel Castings Co., Eddystone, Pa.; Herbert Ohrenberger, U. S. Pipe & Foundry Co., Burlington, N. J., and John L. Crawford, Liberty Mutual Insurance Co., Philadelphia.

Supervisor Training Is Vital

Speaking on *"Keeping Supervision Safety Minded,"* Panelist Thomas H. Bullard said that it is the duty of every department head or superintendent to call his supervisors together periodically to discuss their safety records, and that each supervisor should talk to at least two of his employees on safety every day. Penalties for safety infractions are a last resort, Mr. Bullard said, adding that accident prevention through foresight and planning is infinitely preferable. Supervisors, he said, should be given a clear, concise understanding of their plant's safety program—not fed a lot of statistics on safety. Supervision, he concluded, can do a good job for safety only if it knows definitely what part it plays in the plant's over-all program.

"Background of Accidents" was the topic of Panelist Elmer Huteley, who said that the two primary stumbling blocks to progress in safety are the lack of attention to causes of accidents and the attitude "accidents are for the other fellow." So-called "close shaves" are excellent places to study causes of accidents and often disclose some surprising things, among them lack of safety-mindedness on the part of management, poor supervision, inadequate lighting, sloppy housekeeping, inadequate training, bad ventilation and sanitation and poor plant layout. The attitude "accidents are only hard luck and are paid for by the insurance carrier" is both foolish and expensive, Mr. Huteley said.

"Effective Safety Committee Participation," according to Panelist Earle Layman, depends upon:

(1) Selection of a safety committee jointly by foremen, the union and the safety inspector, with each member to serve one year. Retirement of committee members should be staggered in six-month periods.

(2) Committee to be made up of one representative from every 40 workers, selected from all departments and shifts.

(3) About six supervisors should attend each meeting and the master mechanic should attend all of them.

(4) Meetings should be held monthly, with the safety supervisor planning the program and presiding. Each member must be given an opportunity to speak. All unsafe conditions should be aired and items corrected.

(5) The committeeman should be allowed as much time as is required for transacting safety business and must have the foreman's full cooperation.

(6) Factors that keep the committeeman interested in his job are (a) making the wearing of the safety committee button an honor, (b) lively meeting discussions, (c) recognition of the committeeman's work by plant officials, (d) free luncheons at committee meetings and pay for time spent in meetings, (e) interdepartmental competitions, and (f) a personal interest in safety on the part of all plant workers, including the president.

Discussing *"A Practical Experience in Safety Improvement,"* Panelist Herbert Ohrenberger cited U. S. Pipe & Foundry Co.'s reduction in accidents from 60 in 1946 to 13 in 1950. This, he said, is the result of every employee doing his job safely and every supervisor including safety and accident prevention as an essential part of his daily work. Working through the combined efforts of an eight-man plant safety committee made up of workers, a general safety committee made up of supervisors and a management safety committee consisting of the plant engineer, master mechanic and safety director, U. S. Pipe & Foundry Co.'s management has placed safety and accident prevention on a par with production—a policy that has paid for itself many times.

Safety Embraces All Operations

Concluding session speaker John L. Crawford, discussing *"The Accomplishments of an Activated Safety Program,"* said such a program must compel action by everybody in the plant, including executives, supervisors and staff workers as well as general employees. The program, he added, must embrace every phase of plant operation, selection and indoctrination of new employees, purchase of equipment, training personnel, process engineering, transportation, housekeeping and even budget planning. If this is done, Mr. Crawford said, an activated safety program will result in timely and correct action by personnel, improved morale and reduced labor turnover, favorable accident frequency and loss rates and reduction in costs.

APPLYING RESEARCH FINDINGS IN THE MALLEABLE IRON SHOP

J. E. Rehder
Foundry Engineer
Dept. of Mines and Technical Surveys
Ottawa, Ont., Canada

Recent research has shed some light on questions of everyday importance in the operation of the malleable iron foundry, and in this paper some of the more important practical aspects of melting and annealing have been summarized. The effects of tramp metals in the melt, particularly tin, upon properties and annealability of the iron; carbon, silicon and sulphur control; melt additions; acid and basic furnace refractories; and the first and second stage annealing practices are among the malleable iron production factors included in the discussion.

THE LOGICAL POINT from which to start a discussion of malleable iron metallurgy is in the stock yard, where the raw materials for the melting furnaces are assembled, and it is here that our lack of knowledge shows most clearly. Pig iron, steel scrap, iron scrap and other metallics are analyzed for the usual five elements—carbon, silicon, manganese, sulphur, phosphorus and, in recent years, for chromium.

Trace amounts of many other elements are present in all of these melting materials. Practically nothing is known of their effects, but in some cases they are strongly suspected of exerting considerable influence on the melted iron, its annealability and resultant mechanical properties. Usually these effects are lumped together and called "heredity" and at the moment that is the best that can be done.

Until the effects of each trace element, both alone and in combination with others, are worked out quantitatively, we not only cannot allow for their presence, but do not even know which ones to analyze for. The effects of a few such as tin, copper, nickel, and chromium are now known, but much remains to be done.

Tin Retards Annealing Rate

Tin is a particularly undesirable element in malleable iron, since it has a retarding effect on annealing rate several times as great as that of chromium. Tin can easily enter the melt as bushings, bronze sleeves, and bearing metals, and as little as 0.07 per cent tin will render malleable iron unannealable even at the slowest cooling rates commercially feasible. Since this represents only a few pounds of tin, or one good sized bushing, in a 20-ton air furnace bath, it will pay to inspect all scrap carefully and to segregate any bronze or white metal.

The type of coke used in the cupola in duplex melting is believed by some to have an effect on the annealability of the iron, but it is difficult to see how this could be anything but an indirect effect. If a coke is weak and fast-burning, lowering of the bed will result unless proper allowances are made. Silicon, manganese, and carbon contents will be lower, which will increase annealing time.

There has been considerable discussion recently concerning "oxidized" iron resulting from faulty cupola operation, and the possible ill effects on annealability. The use of powerful deoxidizers, such as aluminum, in the ladle has been investigated, and the effects have been attributed to deoxidization or removal of oxygen from an active role. There is much to be learned in this field, and much more work must be done before the role of oxygen in the behavior of malleable iron is clarified.

Published work to date, however, has shown no advantage in a practical way from the addition of aluminum to molten malleable iron. Until more is learned of the effects, it might be wiser to maintain closer control on melting operations, and to avoid or correct immediately at the source such conditions as a low bed in the cupola.

Most air-furnace operators are familiar with the multitude of details that add up to consistent melting of good quality iron at reasonable cost, and only a few salient points need be mentioned here. It is well known that a portion of the sulphur in the pulverized coal or oil used for firing enters the melt, and as the sulphur content of the fuel increases, so does that of the melt. Since low-sulphur fuels are becoming scarce, there has been a general gradual rise in the sulphur content of the iron as tapped.

Air Furnace Refractory Erosion

Soda ash has been tried as an air-furnace addition to decrease the sulphur content, but slags that are sufficiently basic to carry much sulphur increase the erosion of the acid refractories used in air furnaces. Use of a basic brick for the slag line or furnace bottom would permit use of slags sufficiently basic to desulphurize efficiently, but the question of separation of basic brick from acid brick in a malleable air furnace is difficult.

Basic brick cannot be continued up the side walls of the furnace because of its poor resistance to spalling. Normally a course of a neutral refractory such as chrome or chrome-magnesite brick is used for separation, but in malleable practice this is apparently out of the question, since chromium is rapidly reduced from such brick and enters the melt under malleable air furnace conditions. Possibly a course of pure alumina brick might function as a separator, but this is only conjecture.

However, judgment should be used in taking measures to decrease sulphur content, since in many cases

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there is no metallurgical justification, aside from the slight saving in manganese used, for lowering the sulphur content. Many foundries are operating successfully at 0.14 to 0.16 per cent sulphur content, and in the writer's opinion there have been no demonstrated disadvantages from operating continuously at 0.18 per cent sulphur, provided always that the sulphur content is balanced by the proper amount of manganese.

Another point of furnace operation sometimes overlooked, although well known, is the mottling effect of furnace additions of ferromanganese. Although manganese is a carbide stabilizer, additions of ferromanganese to the furnace will produce mottling in the iron that persists from 5 to 10 min after the last of the addition has dissolved. Iron should not be tapped during this period, but if it is not possible to delay tap-out, some steel scrap charged immediately after the ferromanganese usually will clear up the mottle.

Tapping temperature of iron from the air furnace usually is held to the minimum that will ensure freedom from misruns in the lightest sections in the farthest corner of the foundry, and can be justified on the basis of added refractory and fuel costs for higher temperature iron.

High Tapping Temperature Advances

However, there are two distinct advantages which accompany high tapping temperature, and these are greater freedom from mottle (a higher total of carbon and silicon can be carried mottle-free at higher tapping temperatures), and better annealability (for the same composition, higher tapping temperatures produce iron that anneals more rapidly). It is therefore wise not to run tapping temperatures too close to the misrun point, but rather allow appreciable excess of temperature.

Tapping temperature brings up another point to be considered in the melting process—the reduction of silica from the furnace bottom resulting in increased silicon in the melt. The writer showed in 1946 ("Silicon Pick-Up in Melting Malleable Iron," AMERICAN FOUNDRYMAN, Oct., 1946, p. 50) that not only will the carbon in the iron bath in an air furnace reduce silica from a sand or brick bottom, but that the temperatures involved agree with the thermodynamic theory, and that the rates of reduction can be rapid.

The reaction becomes appreciable at approximately 2820 F, and increases rapidly with temperature. At a given temperature reduction of silica is, of course, more rapid from a sand bottom than from a brick bottom. When this reaction takes place carbon monoxide is formed and rises through the iron as bubbles, and this gentle boiling effect is used in practice as an indication of the temperature of the iron.

For every point of silicon introduced into the melt by reduction, approximately one point of carbon is lost as carbon monoxide, and when iron temperature gets out of control and rises rapidly, as it can near the end of a cold charge, sand bottom air furnace melt, the silicon content of the melt can rise rapidly and the carbon decrease just as rapidly. Usually the net effect on mottle is not large, but the decreased carbon content can seriously affect the fluidity and shrinkage characteristics of the iron.

In duplexing practice where tapping temperature is above 2850 F this reaction is more important than is sometimes realized. Carbon and silicon are oxidized from the surface of the air-furnace bath by direct oxidation from furnace gases or through the slag. However, silicon is being introduced into the melt from the bottom by reduction, and carbon is being lost by the same reaction.

The net loss of carbon and silicon from cupola spout to air furnace spout is the result of these two reactions at the surface and at the bottom of the metal bath, and the actual oxidation loss of carbon in the air furnace is lower than would appear, and the oxidation loss of silicon higher.

However, the net results are the ones of importance, and by the use of high tapping temperatures from the

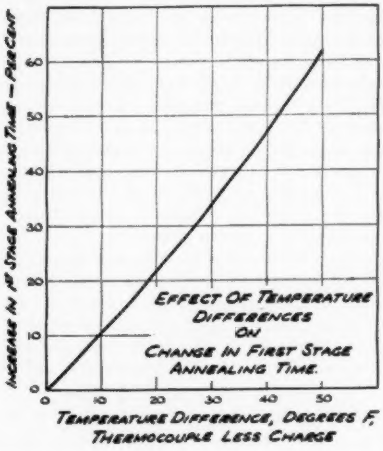


Fig 1—Inaccurate thermocouples and pyrometers and non-uniform heating in large kilns will increase the time required for complete anneal if the temperature is below normal. Above normal temperatures may cause sagging, warping, and lower ductility in the castings.

air furnace, sometimes necessitated by foundry lay-out, it is quite feasible to take iron out of the air furnace with the same or even higher silicon content than that of the entering cupola metal, with appreciable loss in carbon content.

Annealing Process: Our knowledge of the metallurgy of malleable iron annealing still leaves much to be desired, but important additions have been made in the past 10 years. The effect of as-cast section size on the rate of anneal has been thoroughly worked out, and is on a satisfactory quantitative basis. It has been shown that lighter as-cast sections anneal more rapidly due to the finer grain size and, other factors remaining the same, grain size can be plotted against annealing time.

Since other factors, known and unknown, affect as-cast grain size, it would seem to be a useful control to make routine determinations of grain size on standard samples for eventual correlation with annealing room results. It is well known that irons from different

foundries, of the same analysis and cast from the same pattern, may anneal at different rates. Although tapping temperatures may have an important effect, it is likely that differences in grain size will exist, and produce an effect on annealing rate.

The effect of rate of heating to first stage soaking temperature on the soaking time necessary has been worked out. Consideration of the results shows that in terms of the total annealing furnace time, which is the important factor from the cost standpoint, the shortest total time from loading to unloading of the annealing furnace is obtained with the most rapid rate of heating practicable with uniformity of temperature throughout the kiln.

A high nodule count, or a fine distribution of small nodules, accompanies better annealability, and can be achieved by the use of boron or other ladle additives, or by pre-quenching of the white iron. However, from the practical standpoint increase of nodule count as a means of decreasing annealing time should be approached with caution since, when the count is high as in pre-quenched irons, the mechanical properties are poor and at best will meet only a cupola malleable specification.

First Stage Annealing: The effect of the temperature of first-stage annealing, or soaking temperature, on the time necessary for complete decomposition of primary carbide is well understood, and has been quantitatively worked out. The effect is large enough to warrant some attention to accuracy of temperature control, and to uniformity, or lack of uniformity, of temperature distribution in an annealing furnace. Unless routine checks are made, thermocouples and electric pyrometers can get out of calibration and give inaccurate readings.

Furthermore, careful study and experimentation is necessary to ensure that some parts of a large kiln are not considerably hotter or colder than the points at which thermocouples are inserted. Figure 1 shows the importance of these temperature errors or differences.

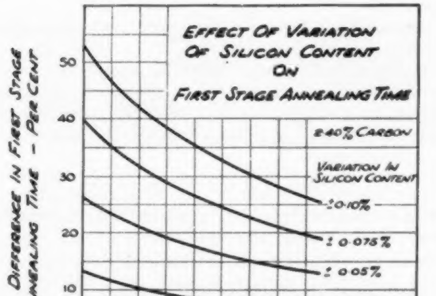


Fig. 2—Silicon content has a relatively large effect on first stage annealing time; for example, with a nominal silicon content of 1.30 per cent, and control limits of plus or minus 0.10 percent (1.20–1.40 per cent) the first stage annealing time will vary about 33 per cent.

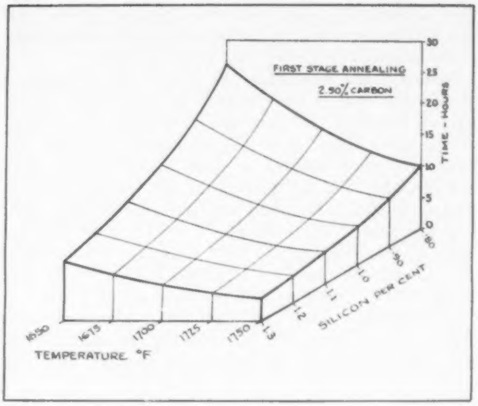


Fig. 3—The relationship of silicon content and temperature as it affects the first stage annealing time required for a particular iron holds generally true for all irons. It is important that low temperature first stage anneal of low silicon iron be avoided.

For example, if the thermocouple reading is 30 F higher than the charge, so that the charge temperature is actually 30 degrees below the temperature which is the normal practice for the plant, the annealing time necessary will have to be extended 34 per cent over normal to achieve a complete first stage anneal.

Usually 1750 F is the maximum temperature commercially practicable for first stage annealing. When this temperature is exceeded by very much, warping or sagging of the castings becomes more serious, and the temper carbon nodules become more irregular in shape, resulting in lower ductility.

Silicon content has a major effect in determining the length of the first stage of anneal, and the quantitative relationship is now well known. The effect is relatively large, and the closest control that is commerically practicable should be obtained. This is particularly true where silicon content is relatively low.

Annealing Time Varies

Figure 2 shows the magnitude of these effects. For example, if a plant is operating at a nominal silicon content of 1.30 per cent, and the control is plus or minus 0.10 per cent, i.e., between 1.20 and 1.40 per cent silicon, then the first stage annealing time necessary will vary by about 33 per cent.

If a nominal silicon level of 0.90 per cent is used, the same control limits will result in iron that varies about 47 per cent in the necessary first stage annealing time. Since the annealing cycle must be set up so that the slowest annealing iron will be completely annealed, considerable time is wasted under such conditions.

For a given iron the effects of both temperature and silicon content on first stage annealing time are easily worked out (Fig. 3). The actual values of temperature and silicon content shown are, of course, accurate only for the particular irons used. The relationships generally are true, and it is evident how important soaking temperature is at low silicon contents, and

how important it is not to have low silicon content and low first stage annealing temperature at the same time, if the shortest annealing cycles are desired.

Second Stage Annealing: As is well known, second stage annealing, or the elimination of pearlite, can be carried out either by slow cooling through the critical temperature range, or by cooling rapidly through this range and then holding at some constant subcritical temperature. For any given iron, the shortest over-all annealing time is obtained in practice by the slow cooling procedure. For example, a certain iron that required 18-hr holding at 1320 F to obtain a completely ferritic matrix, could be rendered ferritic by cooling from 1430 to 1350 F at 12 F per hour (total, 7 hr).

In malleable and gray cast irons, which contain silicon, the location and extent of the critical temperature range depends on the silicon content, and this

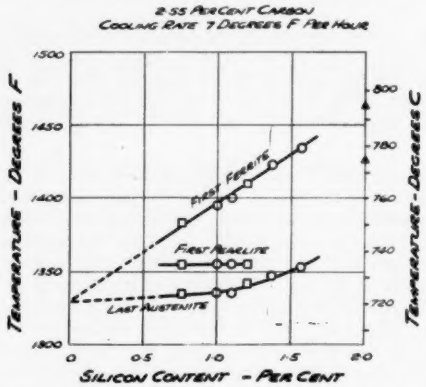


Fig. 4—The location and extent of the critical temperature range of malleable iron depends on the silicon content. This factor must be considered in designing annealing cycles. The effect of carbon content on this range is not accurately known at present.

must be taken into account in designing annealing cycles. The relationship is shown in Fig. 4. The effect of carbon content on this range is not known accurately at present, but it does not appear to be large.

It is only within this range that slow cooling is directly effective. Apparently, the rate of cooling from the first stage soaking temperature to the top of the critical temperature range is without effect on the subsequent annealing and, in the interest of minimum total furnace time, should be carried out as rapidly as practicable.

Obviously, a small furnace charge in open baskets without packing can be brought down much more rapidly without internal temperature lag than a large pot-type kiln with packing. In the latter case the difficulty of obtaining uniform temperature throughout the charge will limit the maximum rate of cooling from first stage soaking temperature.

It should be noted, and emphasized, that the data shown in Fig. 4 represent the precise temperatures involved, with no allowance for safety factor. In practice, the slow cooling should be started well above the temperature shown for a given silicon content, and this safety factor must be larger as temperature control becomes poorer or the size of the kiln increases.

Similarly, the slow cooling should be extended below the bottom of the range shown, to ensure that all castings in all parts of the kiln are below the critical temperature range. In practice this latter point is incidental, since castings are seldom unloaded from a kiln above 1300 F in any case.

Where possible, as in continuous or small batch type atmosphere controlled kilns, the castings should be taken out of the furnace at 1200 F or above, and cooled as rapidly as convenient by fan or water spray. This will greatly decrease the tendency to galvanizing embrittlement, and apparently has a beneficial effect on impact strength.

The course of the reactions taking place during slow cooling through the critical temperature range are shown in Figs. 5 to 7 inclusive. The top of the range is marked by the appearance of traces of ferrite, almost invariably adjacent to temper carbon nodules, the remainder of the matrix being austenite (martensite in these photomicrographs).

As the slow cooling is continued, the amount of ferrite increases at the expense of austenite, and a temperature about halfway down is represented in Fig. 6. When the last traces of austenite have disappeared, the iron is completely ferritic and the anneal is complete.

The maximum rate of cooling through the critical temperature range that will just result in fully annealed castings can be determined for a given foundry only by experiment, or trial and error. Since the cooling rate will be limited by that necessary for the thickest section to be annealed, experiments need be made with only the heaviest casting.

Effect of Various Elements on Annealing Rate

Carbon: The effect of carbon content on annealing rate is not clearly defined, and it is not believed possible at present to state the quantitative effect in all cases.

Silicon: The effect of this element has been outlined in the foregoing paragraphs.

Manganese: The amount of manganese present in malleable iron is usually just sufficient to neutralize the effect of sulphur on annealing rate. For this purpose the manganese is related to the sulphur content by the formula

$$\%\ Mn = (1.7 \times \%\ S) + 0.15;$$

or in a more easily remembered and usable form that gives almost exactly the same results

$$\%\ Mn = 2 \times \%\ S + 0.10.$$

Manganese in excess of this amount has a minor effect on the rate of first stage annealing, but has a strong retarding action on second stage annealing. Very nearly, each 0.15 per cent of manganese in excess of that given by the formulas above will double the annealing time necessary in the second stage. Put in another form, each 0.01 per cent excess manganese will increase the second stage annealing time necessary by about 6 per cent. The importance of close control of the manganese-sulphur ratio is evident from these data, and from inspection of Fig. 8.

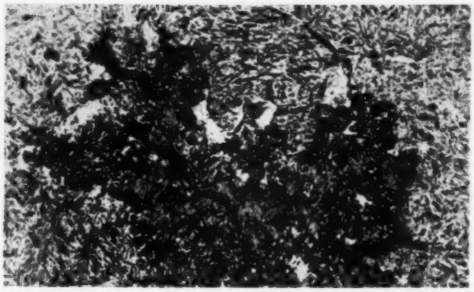


Fig. 5 (above)—Structure of malleable iron quenched from near top of critical range. X750. Etched, 2% Nital.

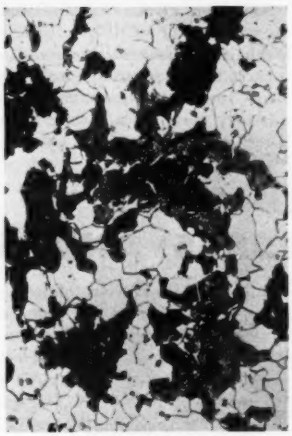
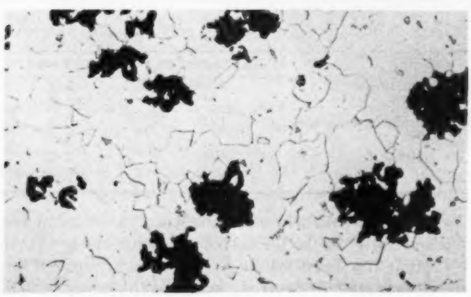


Fig. 6 (right)—Malleable iron structure when quenched from middle of critical range. X100.

Fig. 7 (below)—Quenched from just under critical range, the iron is completely ferritic. X100.



Sulphur: The effect of sulphur in excess of that given by the formulas (which is the same as a deficiency of manganese) on first stage annealing rate is small until very low manganese-sulphur ratios are reached, when a strong retarding effect becomes evident. In second stage annealing, an excess of sulphur (or deficiency of manganese) has a powerful retarding effect, stronger than that of excess manganese. For each 0.01 per cent manganese deficiency, the necessary second stage annealing time is increased by 17 per cent, which is three times as strong a retarding effect as that of the same excess of manganese. Stated in terms of sulphur, each 0.01 per cent of sulphur in excess of that given by the above formula rearranged to show sulphur

$$\% \text{ S} = \frac{\% \text{ Mn} - 0.10}{2}$$

increases the second stage annealing time necessary by 30 per cent. Therefore, a given weight percentage of sulphur is five times as powerful a retardant of anneal as the same percentage of manganese.

However, the question is usually thought of in terms of manganese-sulphur ratio and the excess or deficiency of manganese content over the ratio giving most rapid annealing. For these terms it is evident that, although a correct balance is necessary, it is safer to err on the side of a slight excess of manganese.

Phosphorus: This element has a minor or negligible effect on the time necessary for first stage annealing, but has an appreciable retarding action on second stage annealing. In the ranges of phosphorus content encountered in a given plant the effect is negligible, but when considering two different irons of say, 0.07 per cent and 0.18 per cent phosphorus content, the effect is appreciable and must be taken into account.

Chromium: The quantitative effects of chromium on the annealing rate of malleable iron have recently been outlined by the writer, and remedial measures suggested (J. E. Rehder, "The Relative Effects of Chromium and Silicon Contents on Rate of Anneal of Blackheart Malleable Iron," A.F.S. Preprint No. 51-51, and A.F.S. TRANSACTIONS, 1951, vol. 59). As with manganese, the retarding effect of chromium is much more pronounced in second stage annealing than in the first stage, both effects being more severe than with excess manganese.

Assuming that an existing combination of annealing cycle and iron chemistry is producing a satisfactory anneal in a given plant, an increase in the chromium content of the iron will require certain modifications to the annealing cycle if the same full anneal is to be obtained. The effect of chromium can be compensated for by increase in the silicon content of the iron,

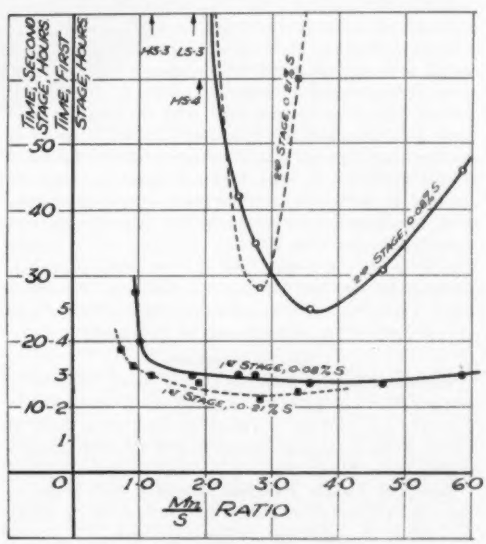


Fig. 8—First and second stage annealing times for malleable iron are shown to be affected by the ratio of the manganese and sulphur contents of the iron.

but the necessary ratio is so large (7 or 8 parts of silicon for each part of chromium) that in practice very little chromium can be compensated for in this way without encountering trouble from mottle in the white iron castings.

Considering first stage annealing only, each 0.01 per cent increase in chromium content will require a 10 per cent increase in annealing time at the previously used soaking temperature; or a 10 F increase in soaking temperature if the previously used soak time must be maintained. Fortunately, the effects are additive, and appreciable increases in chromium content can be cared for by using one or both of the foregoing adjustments.

In second stage annealing, if traces of pearlite begin to appear in the annealed iron due to increase in chromium content, the only recourse is to decrease the cooling rate through the critical temperature range. There are indications that each 0.01 per cent increase in chromium content, in the range 0.01 to 0.10 per cent chromium, will require a decrease in cooling rate of 10 to 15 per cent. If the slowest cooling rate practicable in the particular annealing furnaces being used does not eliminate pearlite, then the iron must be held, after the slowest possible cooling, in the subcritical temperature range of 1250 to 1300 F until the pearlite is eliminated.

It is important to note that if a malleable iron retains primary carbides due to insufficient time or temperature in the first stage of anneal, these can be eliminated by re-annealing since the effects in first stage are additive. However, if pearlite is retained in the iron, it usually cannot be eliminated by re-annealing unless a slower rate of cooling is used during the reanneal.

Aluminum: Many experiments have been made with the addition of small quantities of aluminum to malleable iron. The results of recent work show that there is no practical advantage to be gained from such additions, and if the amount added exceeds a very small quantity, mechanical properties of the annealed iron deteriorate, and serious mottling eventually results.

COLORIMETRIC DETERMINATION OF COBALT IN BRASSES AND BRONZES

I. Geld, and G. Norwitz*
Material Laboratory
New York Naval Shipyard
Brooklyn, N. Y.

Occasionally small amounts of cobalt (up to 0.5 per cent) are added to brasses and bronzes. The usual methods for determining cobalt in such alloys call for the use of gravimetric separations.[2] In this paper the authors propose a convenient and accurate colorimetric procedure for this determination, using hydrochloric acid as the colorimetric reagent.[3] The procedure consists of fuming a portion of the electrolyte from the copper determination with perchloric acid, adding stannous chloride solution, diluting to 100 ml with hydrochloric acid, and reading the blue color in a photoelectric colorimeter. The purpose of the stannous chloride is to eliminate iron interference.[1] Nickel up to 3 per cent does not interfere with the method. Nickel gives a yellow color with hydrochloric acid. The cobalt color obtained with hydrochloric acid varies somewhat with the concentration of the hydrochloric acid.[1] However, for the amounts of cobalt found in brasses and bronzes this variation is insignificant, when the usual concentrated hydrochloric acid of commerce (37 to 38.5 per cent HCl) is used.

Special Reagents

Stannous Chloride Solution (35 per cent): Dissolve 70 grams of $SnCl_2.5H_2O$ in about 100 ml of concentrated hydrochloric acid by warming on the steam bath at about 50 C. Cool, and dilute to 200 ml with concentrated hydrochloric acid.

Standard Cobalt Solution: Dissolve 0.2 gram of pure cobalt metal in 20 ml of nitric acid (1 to 1), and dilute to 1 liter in a volumetric flask.

Dissolve a 1-gram sample of the brass or bronze in nitric acid, filter off the metastannic acid, and electrolyze for copper and lead in the usual manner. Transfer an aliquot of the electrolyte equivalent to 0.5 gram of the sample to a 250-ml beaker. Add 5 ml of perchloric acid, and evaporate to strong fumes of perchloric acid. Cool and add 5 ml of stannous chloride solution (35 per cent). Dilute to 10 ml with concentrated hydrochloric acid. Read the color at 660 millimicrons in a photoelectric colorimeter (1-cm cell) that has been set to zero with concentrated hydrochloric acid. Convert the readings to per cent cobalt by consulting a reference curve. To prepare this reference curve pipette out aliquots of the standard cobalt solution and fume with perchloric acid. Add stannous chloride solution and dilute with hydrochloric acid in the regular manner.

Table I—Results for Cobalt in Synthetic Samples

Sample	Cobalt Added, %	Cobalt Found, %
52b (Tin Bronze)	0.10	0.10
		0.09
62b (Manganese Bronze)	0.20	0.20
		0.20
TA (Nickel Bronze, 2.1% Ni)	0.40	0.40
		0.42

Results obtained for cobalt on synthetic samples are shown in Table I.

The authors are attempting to modify the above procedure for the colorimetric determination of cobalt in steels.

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*Present address, 3353 Ridge Ave., Philadelphia, Pa.

Note: The opinions expressed in this article are those of the authors, and are not to be construed as representing the official views of the Navy Department.

CUPOLA COURSE, ESSAY CONTEST SPONSORED BY A.F.S. CHAPTERS

TWO EDUCATIONAL PROJECTS undertaken by A.F.S. Chapters in recent months, though widely divergent in character, have a common purpose—betterment of the foundry industry through education.

The first of these projects was Metropolitan Chapter's three-day Cupola Operations Course at Stevens Institute of Technology, Hoboken, N. J., and the second, Southern California Chapter's Second Annual Essay Contest for Junior College Students.

Metropolitan Chapter's Cupola Operations Course, held April 12, 13 and 14, was divided into five meetings of two hours' duration, with B. P. Mulcahy, Fuel Research Laboratories, Indianapolis, discussing a different aspect of cupola operation at each session. Notable among the many foundrymen attending the course were two foundry instructors from Brazil, in this country to study U. S. shop teaching methods—Arthur Nilo Bispo of Escola Tecnica de Recife, Pernambuco, and Raphael Pandolfo of the Escola Tecnica Parobe, Porto Alegre, who attended as guests of Edwin Doe of Brooklyn Technical High School. Each session of the course had a different chairman, selected from the Chapter's membership: Spencer Harris, American Abrasive Metal Co., Irvington, N. J., John A. Bukowski, Atlas Foundry Co., Irvington; Charles Preusch, Crucible Steel Co. of America; Harrison, N. J., and Frank O'Connor, O'Connor Foundry Co., Hackettstown, N. J. The Cupola Operations Course was planned and supervised by members of the Chapter's Educational Committee, headed by Chairman William H. Ruten, Polytechnic Institute of Brooklyn, assisted by Charles Preusch, Crucible Steel Co. of America, Harrison N. J., and William Maher, Barnett Foundry & Machine Co., Irvington, N. J.

John E. Wilson, Southern California Chapter President (left) presents $50 first prize in the chapter essay contest to Ivan Schroeder of Los Angeles-Trade-Technical Junior College as Miss Emma Beekman of the junior college's Academic Department, beams proudly.

An outstanding feature of the three-day, five-session course was the informal and informative exchange of questions and answers between members of the class and the speaker on a wide variety of cupola problems. Mr.Mulcahy was able to suggest remedies for many of the individual cupola problems presented to him during and after each session.

Major topics discussed by Speaker B. P. Mulcahy and members of his audience during the five-session Cupola Operating Course included the following:

(1) **Cupola**—dimensions, lining, well, tuyeres, repairs, slag and tap hole.

(2) **Wind**—equipment, rates, hot blast, cold blast, dry blast, balanced blast.

(3) **Fuel**—bed heights, preparation, burn-in, combustion, coke-charge requirements, coke characteristics, theory and practice.

(4) **Raw Metal**—types and sizes, weights, composition adjustments.

(5) **Fluxing**—purpose, composition, requirements, front and rear sagging, slag disposal.

(6) **Metal Temperature**—significance, measuring.

(7) **Mechanical Charging**—requirements, types.

(8) **Metal Composition**—chemical and physical property advantages, use of graphitizers and deoxidants, use of alloys.

Southern California Chapter's Second Essay Contest for Junior College Students, open to all interested students of the Chapter area, awarded prizes for the best papers describing visits to local foundries. For the first time this year, contestants were permitted to augment their impressions of trips to cooperating foundries with sketches, photographs and clippings from foundry technical literature. Contest was made possible by cooperation between local foundries, junior college officials and City, County and State Boards of Education. Winner of $50 first prize Ivan Schroeder described his visit to an aluminum foundry, while winner of the $35 second prize described a gray iron foundry. Other prize winners were: Donald M. Evans, Keizo Suenaga, Greg Wroblewski, Robert L. Dunham, Hugh Chase, Robert Steele, Jacob Lee, Carl E. Avery, Benjamin Fong and Samuel Goldstein.

Contest was sponsored by the Chapter's Educational Committee, consisting of Chairman E. K. Smith, U. S. Army Ordnance Corps; Paul B. Bergman, Electro Refractories & Alloys Corp.; James R. Cady, University of Southern California; Kenneth L. Clark, International Nickel Co.; J. M. Crawford, Independent Foundry Supply Co.; W. D. Emmett, Los Angeles Steel Casting Co; Robert Gregg, Reliance Regulator Co.; Stanley Jackson, Electro Metallurgical Co., Div., Union Carbon & Carbide Corp.; John W. Janca, Westlectric Castings; L. M. Nash, Magnesium Alloy Products; and Otto H. Rosentreter, National Engineering Company.

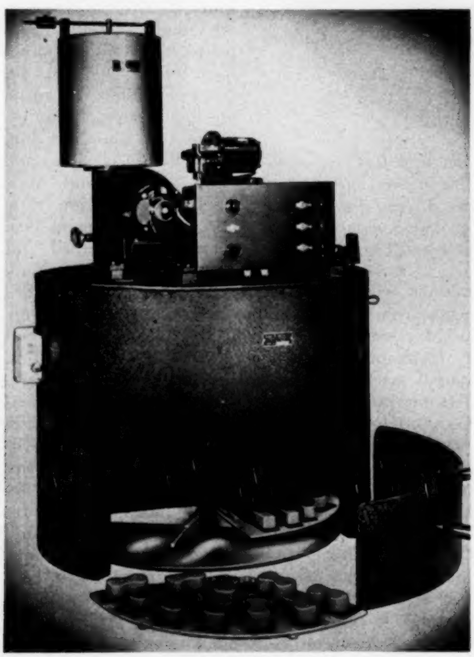
Core strength variations and quantities of binders necessary have been reduced by establishing absolute humidity values in core oven atmospheres for baking various core mixtures. Once the optimum value has been determined, core oven atmosphere controls can maintain it. Other recent AMERICAN FOUNDRYMAN articles on humidity effects are: Murton, Fairfield, and Richardson, "Core Oil Evaluation Method," April, 1951, p. 85; and Dietert, "Factors Affecting Oil-Sand Core Baking," May, 1951, p. 67.

CORE STRENGTH VARIATIONS DUE TO OVEN HUMIDITIES

Harry W. Dietert, Pres.
and
Alex L. Graham, Res. Engr.
H. W. Dietert Co.
Detroit

VARIATION IN THE BAKED STRENGTH of cores due to a change in the humidity of the air has been a troublesome problem in the foundry. This problem may be turned to a distinct advantage by determining the absolute humidity of the core oven atmosphere which will produce cores of maximum strength. Once an optimum absolute humidity value is known, it remains only to control the atmosphere within a core oven at that value. The control problem will depend on the type of fuel and whether the oven is batch or continuous type.

The influence of absolute humidity on the baked strength of a core can be determined readily by using a batch type core oven heated by electric resistance elements and having the volume of incoming air and volume of recirculating air controllable. The laboratory oven illustrated in Fig. 1 meets these requirements, and was found to lend itself admirably to the determination of optimum absolute humidity.



Unlike gas or oil fired core ovens, electric resistance ovens produce no moisture from combustion and, therefore, once the drying stage has been completed it is necessary to control only the moisture in the incoming air. During the first phase of baking the moisture is driven out of the cores and the atmosphere in the core oven differs from that of the incoming air. However, during the baking phase the absolute humidity of the core oven atmosphere becomes that of the incoming air so that the core oil can undergo its chemical change in an atmosphere of a selected absolute humidity.

By changing the absolute humidity of the incoming air for each test batch of cores it is possible to bake cores at selected humidities. Plotting the tensile strengths of cores baked for various absolute humidities will give a graph such as Fig. 2. This shows how the absolute humidity of incoming air to the core oven affects the baked strength of cores bonded with raw linseed core oil, using A.F.S. standard sand.

Humidity Control Required

Maximum strength is secured when the absolute humidity is slightly less than 60 grains of moisture per pound of dry air. Unfortunately, the strength-absolute humidity curve is peaked, at 58 grains of moisture, which means that close absolute humidity control is required to secure maximum strength. For conditions as stated, the strength of cores decreases rapidly when absolute humidity either increases or decreases from this optimum value.

The maximum strength of 278 psi at 58 grains of moisture is reduced to a minimum strength of 156 psi when the absolute humidity is increased to 92 grains of moisture. When dried air is fed to the core oven the strength is 175 psi. Injecting steam into the laboratory test core oven produced cores with a strength of 193 psi.

Conclusions based on the tests reported are:

1. Relative humidity is not a direct measure of the actual moisture in air and does not lend itself precisely to core oven atmosphere control. Absolute humidity

Fig. 1— Laboratory core oven is electrically heated and equipped with air dryer and air volume controls.

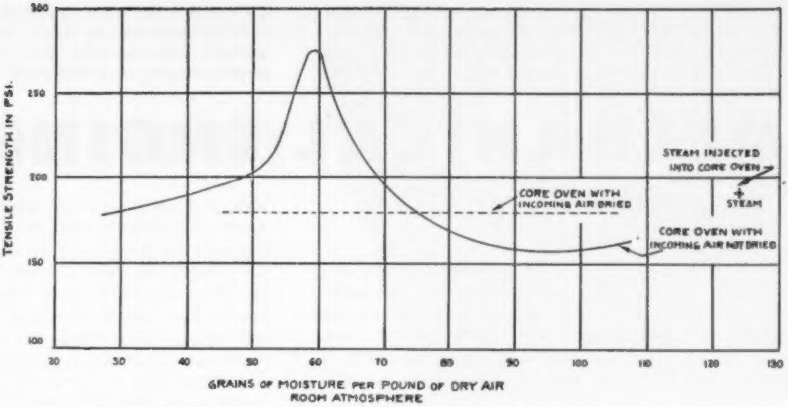


Fig. 2—Baked tensile strengths of cores at various absolute humidities are plotted to show relationship of baked strengths to the amount of moisture present in the core oven atmosphere.

is the proper index to use for expressing moisture in core oven atmosphere.

2. The first step in applying in practice the benefits of absolute humidity control to foundry core ovens is to use a laboratory test core oven to determine the optimum absolute humidity value for each core sand mixture which may be used in the foundry production.

3. The final and more difficult step is to equip the foundry core oven or ovens with absolute humidity control. Instituting such control over core baking offers means to produce two beneficial results: (a) reduction in core strength variations; and (b) reduction in quantity of core binder or binders to produce required strength.

Plan Expansion of Missouri School of Mines Foundry

Meeting recently at Rolla, Mo., the FEF Industrial Advisory Committee discussed plans for expansion of foundry facilities at Missouri School of Mines, to the extent that some $50,000 worth of foundry equipment may eventually be added. Present at the meeting were, starting left, bottom row: George Mellow, Liberty Foundry; A. L. Hunt, National Bearing Div., American Brake Shoe Co., and C. R. Culling, Carondelet Foundry Co., all of St. Louis; FEF President Claude B. Schneible, Claude B. Schneible Co., Detroit; Dean Curtis L. Wilson, FEF Executive Director George K. Dreher, and Prof. D. S. Eppelsheimer. Second row: MSM Metallurgy Department Chairman A. W. Schlechten; Webb L. Kammerer, Midvale Mining & Mfg. Co., J. A. Williamson, M. A. Bell Co., and Ralph M. Hill, East St. Louis Castings Co., and L. R. Kleber, General Steel Castings Co, all of the St. Louis area; Metallurgy Instructor A. LeClaire, and Assistant Dean R. Z. Williams. FEF scholarship students pictured are, third row: A. B. Charneski, R. E. Schuchardt, G. E. Burgess, J. L. March, James Salmas and E. W. Cawthorne. Fourth row: J. M. Wheeler, G. W. Sullivan, W. J. Ruprecht, N. F. Neumann, and W. C. Wurtz.

The authors analyze foundry personnel requirements and discuss the suitability of mechanical engineers and their training for various types of foundry work. This is one of a series of papers appearing in AMERICAN FOUNDRYMAN outlining the practical and theoretical training received by engineering college students now entering the foundry industry. Other papers appeared in the April, May, and June issues.

MECHANICAL ENGINEER in

L. C. Price* and C. C. Sigerfoos**
Michigan State College

IN STUDYING THE ROLE of the mechanical engineering graduate in the foundry industry, the authors decided first to examine the foundry industry and find out what kind of jobs there are in it. Second step is to discuss the training which mechanical engineering students in general and Michigan State College students in particular, receive, and see how this training fits them to fill these jobs. For information about the jobs reference was made to Job and Position Descriptions for the Casting Industry and to the Supplement to Job and Position Descriptions.† The Supplement classifies jobs as one-star jobs, two-star jobs, etc., according to the training which is required by the holder of each job.

As the requirements become higher the job is no longer called a job but a position. A five-star position requires basic technical and business knowledge more readily and more thoroughly acquired through college and supplementary training. It is in these positions that a graduate of an engineering college would most likely be found. The authors examined these positions and checked the ones into which it seemed that mechanical engineering graduates would fit. These were designated as A, B, C, or D to indicate: A–use, specification, research and design; B–production and management; C–critical functions, by which is meant such things as inspection, accounting, and finance; and D–sales and distribution.

Classifying Positions for Engineering Graduates

An overwhelming majority of these positions fall under B. Out of a total of 40 classifications where mechanical engineers seem to fit, only two come definitely under the A heading, four under the C heading, three under D, and 31 under the heading of production and management. The two under A seem to be only a director of research and development and a foundry products engineer. It is hard to believe that there are only two under that heading; surely if there is to be a director of research and if the company is a fairly large one there must be some researchers for him to direct. It is easy to see that production and management, the B classification, would include the majority of the engineering postions.

Under critical functions (C) would be: purchasing agent (require some knowledge of mechanical engineering as well as some knowledge of finance); cost accountant (would not necessarily need any engineering); and comptroller who likewise could get along with no engineering training. At Michigan State College, at least in the mechanical engineering department, it is believed that the best training for a sales engineer is a good course in design. If that viewpoint is a legitimate one then it would seem that the holders of the three positions under sales and distribution (D) should have first of all a good general mechanical engineering education with strong emphasis on the fundamentals and a leaning toward design.

Since so large a majority of the positions listed fall under the production and management classification it may be worth while to enlarge somewhat upon that subject and examine some of the jobs to see what kind of engineer is required to fill each. Beginning at the top, the general manager would not necessarily be a mechanical engineer but could easily be one, especially since in the case of Michigan State almost 40 per cent of all the engineering graduates are mechanical.

Need Job Experience

Nobody expects a newly graduated mechanical engineer to become general manager right away. The general manager must know many things beyond his fundamental training, whatever that may be. He will almost certainly have to acquire that knowledge over a good many years in the employment of the same com-

Table I— Outline of Introductory Foundry and Patternmaking Course Sophomore Year

Foundry Lectures	Hours
1. The casting process, divisions and size of the industry, etc.	1
2. Melting furnaces with emphasis on the cupola	1
3. Composition and control of cast metals	2
4. Laboratory and shop tests for physical properties of cast metals	1
5. Casting design factors	1
Foundry Laboratory (demonstrations, group discussions, or assigned projects)	
1. Hand molding, bench and floor	6
2. Coremaking	3
3. Molding machine operation	6
4. Cupola operation and pouring molds	3
5. Cleaning and trimming operations	3
6. Inspection and study of casting defects	3
7. Crucible melting and pouring of aluminum	3
8. Sand testing demonstration	1
9. Miscellaneous (shake out, setting cores, making up charges, etc.)	2
Patternmaking Lectures	
1. Materials and tools for pattern construction	2
2. General principals of pattern construction	2
3. Pattern tooling and rigging	1
Patternmaking Laboratory (demonstrations and assigned projects)	
1. Use and care of patternmaking tools	6
2. Making pattern layouts	4
3. Making stop plate pattern	6
4. Making name plate pattern	4
5. Lathe work and making washer pattern	6
6. Making bracket pattern with dovetailed joints	4

†Compiled by George K. Dreher, Foundry Educational Foundation.

*Head, Department of Mechanical Engineering.

**Associate Professor of Mechanical Engineering.

Liaison engineer for Albion Malleable Iron Co. building program, J. T. Ehman (left in photo) became an engineering trainee in the Albion foundry upon graduation from Michigan State College in June, 1949.

the FOUNDRY

Table II—Outline of Foundry Technology Course
Given in junior year as continuation of course outlined in Table I

Lectures	Hours
1. Casting methods: sand molding, permanent molds, die casting, etc.	3
2. Foundry sand testing and control	2
3. Pattern design and tooling for production	2
4. Molding and coremaking machines	2
5. Foundry layouts for job and production work	2
6. The metallurgy and properties of ferrous cast metals	3
7. The metallurgy and properties of non-ferrous cast metals	1
8. Melting furnaces: cupola, electric, crucible, and air furnace	2
9. Cleaning and inspection of castings	1
10. Casting design	2
Laboratory Projects	
1. Molding and core sand testing experiments	6
2. Advanced molding and coremaking projects	3
3. Calculation of charges for electric furnace melting	3
4. Pouring of iron test specimens from electric furnace	3
5. Examination and physical testing of iron specimens	3
6. Cupola design and calculation of charges	3
7. Oral report by individual students on new foundry developments	6
8. Inspection trip to commercial foundry	3

pany or similar companies. He will have to be a man of sufficiently high caliber to acquire that knowledge he needs and will be able to handle men and to administer the general affairs of the business, all of which require a great deal beyond a basic technical knowledge.

The same applies, although in somewhat lesser measure, to department and assistant superintendents. They must know many things beyond their basic technical knowledge and these may, probably must, include personnel relations and other non-technical matters. A number of these positions come under the heading of industrial engineering. Industrial relations manager, industrial engineer, works manager, production manager, planning and scheduling engineer, production methods engineer, and safety engineer all require training in subjects which are collectively called industrial engineering. At Michigan State College, industrial engineering is one of the options in the department of mechanical engineering, therefore these positions will be discussed in some detail.

Assuming that Michigan State College is not too different from the majority of schools which have a department of mechanical engineering, it is proper to examine the curriculum to see what training the boys get which will fit them for the positions mentioned above.

Senior mechanical engineering students at Michigan State elect one of four options. These are:

Automotive and Aeronautical. These two are actually separate but are so nearly alike that they are listed as one. The automotive boys specialize in automobiles and have courses in engine and chassis design. The few who elect aeronautical have other classes in airplane engines rather than automobile engines and do some work in fluid mechanics and aerodynamics as well as airplane structures. Both groups take advanced metallurgy throughout their senior year.

Design. Those who elect the design option take more work in advanced design than the others do. The other distinguishing characteristic of the design option is that the students get considerably more metallurgy—in the fall term a course in the metallurgy of steel, in winter, metallurgy of non-ferrous metals, and in spring a course in the metallurgy of cast ferrous metals.

Power. There is not much in the power option that is directly applicable to foundry work. The distinguishing characteristic of this option is that the student has two courses in power plants, two in refrigeration, and two in heating and ventilating.

Industrial. This option has been left to the last for two principal reasons. First, it accounts for half, perhaps slightly more than half, of all mechanical engineering graduates since industrial engineering is not a separate department at Michigan State but is a part of the Mechanical Engineering Department. Second, the functions of production and management, the B classification, referred to above, accounts for such a large part of the positions which are listed in the job and positions descriptions of the foundry industry. Students who take this option get, in addition to the foundation courses, work in plant layout and materials handling, personnel relations, the economics of manufacturing, production control, and job evaluation. It almost goes without saying that in the time allotted, the students cannot get any more than a bare introduction to any of these specialized subjects but at least they get enough so that when the occasion arises they can pursue the subjects further under their own power.

Leading up to all of the specialized courses which have been listed under the options is a good curriculum in the fundamentals of engineering such as mathematics, physics, chemistry, mechanics, thermodynamics, and metallurgy. One of the notable things about the curriculum is the large amount of metallurgy which is included in the mechanical engineering curriculum, especially for those who elect the automotive and the design options. The authors believe that before a man can be any special kind of a mechanical engineer he

must be a mechanical engineer with all the fundamental training that this implies.

The practical applications of many of the principles of engineering are provided in the shop courses. The introductory course in foundry practice, as outlined in Table I, is required of all mechanical engineers. This course is taken in the sophomore year in combination with pattern practice and is one of the few engineering courses in the country in which foundry and pattern work are closely coordinated. The work is arranged to give the student an opportunity to mold and cast from at least one of the patterns that he himself has made. Junior mechanical engineers take the course outlined in Table II which is offered as a continuing study of foundry operations.

Students Operate Production Foundry

An interesting phase of the laboratory work in these courses is that students operate the foundry part of the time on a semi-production basis, casting eight of the vital parts for a small air compressor. The castings made on this project include an iron fly wheel, a deep-finned iron cylinder, an alloy iron crank shaft, and an aluminum alloy piston cast in a permanent mold. The various casting procedures are set up to maintain their respective teaching values and at the same time build up a stock of castings to supply machining and assembly lines in the other mechanical engineering shop courses. When the compressors are finished, any student involved has the privilege of buying a finished compressor for his own use at the cost of the materials.

Students who have FEF scholarships take additional foundry work. Even before Michigan State was put on the Foundation scholarship list three elective foundry courses had been inaugurated. These run throughout the senior year and consist of a study of the selection and control of important foundry materials, problems covering foundry layouts, casting design, and the design and operation of foundry furnaces. These courses are open to all who have the prerequisites.

A graduate in mechanical engineering and an engineer who works in any of the branches of mechanical engineering in a foundry or anywhere else must first have a good foundation in basic engineering, then a good foundation in basic mechanical engineering, and only then is it necessary or desirable for him to be introduced to the various specialties in the field. After graduation, and in work of any kind, he may and almost always will run into problems which are outside any speciality he may have anticipated. He will then, if his basic engineering is sound and if he is any good as a man, go to proper references or take other steps to find out about the particular problem which confronts him.

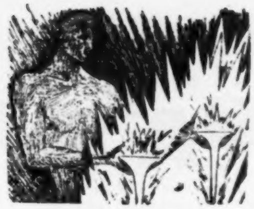
Some people seem unconsciously to take the attitude that what a student does not learn in a college education he never learns. If that were true it would be utterly impossible to try to anticipate all of the areas of special knowledge which he may need at later dates. The field of mechanical engineering is broad enough to include many specialities and any one capable of doing more than routine work will be able to apply his fundamental knowledge to the problem at hand.

Design Engineer Serves Customer

The design engineer is often of more use to the foundry customer than to the foundry itself. On the other hand, there are many cases in which a design engineer in the foundry has to work from the customer's product and with customer engineers in order to improve the customer product, especially from a standpoint of the castings involved. The MSC design group and the industrial group are now working together with the idea of giving the design boys something about the application of time and motion study and safety to the design of machines and conversely to give the industrial engineering specialists some more on the fundamental problems involved in machine design. Whether the best man for the foundry is a mechanical engineer, a metallurgist, or an industrial engineer, is hardly possible to say. The same basic engineering education is required of all, and on the job it is necessary that they all work together. If they do not work together and if their work does not dove-tail then the finished product will not be satisfactory.

International Foundry Congress Visitors to See Ardennes

Visitors to the International Foundry Congress, to be held in Brussels, Belgium, September 10 to 14 will have the opportunity to participate in a two-day Post-Congress tour of the Ardennes mountains of Belgium, scene of World War II's "Battle of the Bulge." Monument shown at the left commemorates the heroic stand of the "Battered Bastards of Bastogne," who withstood the onslaughts of Hitler's crack panzer armies during Christmas of 1944. At right is one of Belgium's historic beauty spots, the Quai Verte in the town of Bruges.



CONGRÈS INTERNATIONAL DE FONDERIE

SCHEDULED FOR BRUSSELS FROM SEPTEMBER 10 TO 14

INCREASED FOUNDRY PRODUCTIVITY will be the theme of the 1951 International Foundry Congress, when members of the Belgian Foundry Technical Association will be hosts to their fellow foundrymen from many nations at Brussels, September 10 to 14.

Scheduled for the six-day meeting are five half-day technical sessions, social events and plant visitations, a ladies' entertainment program, and if possible, meetings of international delegates with United States Economic Cooperation Administration concurrently during the entire Congress. The subject of these informal talks between foundrymen and ECA officials will be means of increasing productivity in overseas foundries.

A.F.S. President To Be Delegate

A.F.S. National President (now President-Elect) Walter L. Seelbach, Superior Foundry, Inc., Cleveland, will be the official A.F.S. delegate to the Congress. President Seelbach, accompanied by Mrs. Seelbach, will convey a message of greeting from the Society and will extend an official invitation to overseas foundrymen to attend the 1952 International Foundry Congress, when A.F.S. will be host to the world's foundrymen at Atlantic City.

Selected to present the official exchange paper of the American Foundrymen's Society at the International Foundry Congress is J. B. Caine, foundry consultant of Wyoming, Ohio, who will discuss the risering of castings.

Official languages in which papers will be printed and discussed are French and English. The Congress will open Monday morning, September 10, with addresses of welcome by Marcel J. Borgerhoff, president of the Belgian Foundry Technical Association, and by F. W. E. Spies of The Netherlands, president of the International Committee of Foundry Technical Associations. First Congress technical session will take place in the afternoon, followed by a social hour at the Hotel de Ville, Brussels.

Thursday morning and afternoon will be devoted to technical sessions and in the evening a dinner and dance will be held.

Wednesday, September 12, will be given over to visits to the Esperance Longdoz, Ferblatil and Ougree Marihaye plants at Liege. Visitors will depart for Liege in buses at 9:00 a.m. and return to Brussels at 7:00 p.m.

Day's program on Thursday, September 13, will consist of two technical sessions and the official banquet of the International Foundry Congress.

On Friday morning, September 14, motor coaches will take visitors on a tour of Charleroi area foundries.

Meeting during the Congress will be the International Committee of Foundry Technical Associations, International Committee on Foundry Defects, International Committee on Testing Cast Iron, and the International Dictionary Committee.

Schedule Tour of "Bulge" Country

Immediately following conclusion of the six-day Congress will be a two-day Post-Congress tour of Belgium's Ardennes country, scene of World War II's "Battle of the Bulge." The tour, which is optional, will include a visit to the historic battlefield and monument at Bastogne.

Ladies' entertainment program will run throughout the Congress and, like the Congress, will open with an address of welcome from Messrs. Borgerhoff and Spies on Monday morning, September 10. Ladies of the Congress are invited to the social hour that evening in the Hotel de Ville, Brussels.

Tuesday morning will be devoted to a guided tour of Brussels and, following luncheon, motor coaches will tour Belgium's Gasbeek and Beersel castles. In the evening, ladies are invited to a dinner and dance.

An all-day motor coach trip is scheduled to include the ancient towns of Ghent and Bruges on September 12, with luncheon and tea in Bruges. Thursday morning, September 13, will be free. That afternoon, coaches will motor to Tervueren, where tea will be served. In the evening will be the official banquet.

Final day's ladies' entertainment program will comprise a visit to Antwerp and the home of the painter Rubens. Luncheon will be served on a boat in Antwerp Harbor and a tea will be given at the Zoo.

Ladies of the Congress are also invited to participate in the two-day Post-Congress tour of the Ardennes "Battle of the Bulge" country.

Make Arrangements Through Travel Agencies

Registration fee for the Congress is 600 Belgian francs for members and 200 francs for ladies. American foundrymen desiring to attend the Congress are requested to make arrangements through their own travel agencies for reservations in the Hotel Metropole, Palace Hotel or Hotel Central, Brussels. An office will be established in the Fabrimetal Building, site of the Congress, for exchanging money and cashing travelers' checks. Further information is available from J. Foulon, Secretary, Association Technique de Fonderie Belge, 21 rue des Drapiers, Brussels. Cable address is T. F. 11.55.18 Association Fonderie, Brussels.

New AFS MEMBERS

NEW SUSTAINING MEMBERS

Lester B. Knight & Associates, Inc., Lester B. Knight, Pres. (Chicago Chapter)—Conversion from Company.

Walworth Co., S. Boston, Mass., R. A. Bell, Works Mgr. (Non-Chapter)—Conversion from Company.

NEW COMPANY MEMBERS

Hamilton By-Products Coke Ovens Ltd., A. J. Mullen, Sales Mgr. (Ontario Chapter).

West Virginia Malleable Iron Co., Point Pleasant, W. Va., G. C. Jackson, Pres. (Non-Chapter) — Conversion from Personal.

Worthington Pump & Mach. Co., William F. Weinreich, Asst. to Vice Pres. (Northwestern Penn. Chapter).

CHAPTERS

BIRMINGHAM DISTRICT CHAPTER

R. G. Mulligan, Fmn., Jefferson Foundry.

CANTON DISTRICT CHAPTER

Leonard A. Krell, 2nd Vice Pres., Colonial Foundry Co.

CENTRAL ILLINOIS CHAPTER

Ralph T. Brower, Jr., College Graduate Trainee, Caterpillar Tractor Co.

Llewellyn A. Cox, Midwest Sales, Werner G. Smith, Inc.

CENTRAL OHIO CHAPTER

Ralph A. Garverick, Plant Mgr., Huber Mfg. Co.

Dallas M. Marsh, Fdy. Engr. Trainee, Cooper-Bessemer Corp.

Harry Miley, Fdy. Fmn., Huber Mfg. Co.

CHESAPEAKE CHAPTER

Sigvart P. Terland, Molder, U.S. Naval Research Laboratory.

CHICAGO CHAPTER

Erling A. Dunham, Wells Mfg. Co.

Ernest D. Fahlberg, Assoc. Met., Continental Fdy. & Mach. Co.

Arthur S. Hedberg, Supt., Wells Mfg. Co.

Walter Kowalski, Fdy. Fmn., Wells Mfg. Co.

Edward Malek, Fdy. Fmn., Wells Mfg. Co.

Casimir W. Marciniak, Fmn., McCarthy Foundry Co.

Albert A. Milkie, Sales Engr., Hewitt-Robins, Inc.

Peter M. Przybylowicz, Fmn., McCarthy Foundry Co.

M. E. Stewart, Fdy., Met., Wells Mfg. Co.

DETROIT CHAPTER

Kermit Bennett, Wood Patternmaker, Packard Motor Car Co.

Joseph G. Fabiano, Patternmaker, Cadillac Motor Car Div., G.M.C.

Harry Fik, Facilities Engr. Ford Motor Co., Rouge Plant.

Floyd D. Gross, Supt., Pattern Control, Kaiser-Frazer Corp., Engine Div.

Robert E. Guisinger, Labor Relations Repr., Ford Motor Co.

Robert R. Penman, Mfg. Engr., Ford Motor Co.

Richard E. Reiter, Mfg. Engr., Staff Cons. Office, Ford Motor Co.

Norman Dale Stevens, Met. Tester, Ford Motor Co.

Kenneth S. Thomas, Expeditor, Kaiser-Frazer Corp., Engine Div.

Howard C. Tuttle, Detroit Editor, Penton Publishing Co.

EASTERN NEW YORK CHAPTER

Berkeley D. Ellis, Met., American Locomotive Co.

METROPOLITAN CHAPTER

Thomas M. Boyd, Operating Dept. Spec. Appr., American Brake Shoe Co.

Raymond S. Hull, Fdy. Engr., Chem. Div., Borden Co.

Harry E. Lewis, Gen. Ind. Sls. Mgr., Great Lakes Carbon Corp.

S. J. Sindeband, Exec. Vice Pres., Mercast Corp.

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Federico Padilla, Engr., Cobre Y Aleaciones, S.A.

MICHIANA CHAPTER

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Robert D. Russell, Salesman, Pickands Mather & Co.

NORTHEASTERN OHIO CHAPTER

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John E. Fahlman, Met., Permold Co.

Paul Schweizer, Trainee, Superior Foundry, Inc.

NORTHERN CALIFORNIA CHAPTER

Nino V. Davi, Fdy. Fmn., Pacific Steel Casting Co.

George Felix, Asst. Fmn., H. C. Macaulay Fdy. Co.

N. W. PENNSYLVANIA CHAPTER

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Lloyd L. Vroomen, Dist. Engr., American Brake Shoe Co.

Worthington Pump & Mach. Co., William F. Weinreich, Asst. to Vice Pres.

ONTARIO CHAPTER

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J. J. Fahlenbock, Asst. Sales Mgr., Hamilton By-Products Coke Ovens Ltd.

Harold Gray, Fdy. Supt., Wallaceburg Brass Ltd.

James A. Keech, Salesman, Werner G. Smith Ltd.

Hamilton By-Products Coke Ovens Ltd., A. J. Mullens, Sales Mgr.

A. M. Wright, Salesman, Hamilton By-Products Coke Ovens Ltd.

OREGON CHAPTER

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PHILADELPHIA CHAPTER

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Francis J. Bernarding, Sales Engr., J. S. McCormick Co.

M. J. Kirsch, Sales Engr., Kerchner, Marshall & Co.

Thomas A. Landis, Plant Supt., Ajax Metal Div., H. Kramer & Co.

Edward W. Neumann, E. C. Troy.

Thomas L. Robershaw, Appr., Eastern Malleable Iron Co.

Fred T. Schaefer, Indus. Engr., Philadelphia Coke Co.

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Herman Meyers, Fdy. Supt., John Deere Plow Works.

SAGINAW VALLEY CHAPTER

Edwin L. Whiffin, Student, Chev. Grey Iron Fdy., G.M.C.

SOUTHERN CALIFORNIA CHAPTER

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George E. Caloudes, Coreroom Fmn., General Metals Corp.

Sherman Duffey, Owner, Rapid Foundry.

Alfred A. Grant, III, Owner, Grant & Co.

Charles J. Hofschroer, Student, Kay Brunner.

Jack Markowich, Fmn., Brass Melting Div., Modern Pattern & Fdy. Co.

Bruce George Moody, Moody Sprinkler Co.

James M. Tucker, Owner, Tucker Bros. Foundry.

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Stanley E. Rowland, Patternmaker, Ross-Meehan Foundries.

TEXAS CHAPTER

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Robert K. Hoague, Sales Engr., Lone Star Steel Co.

W. P. Hooper, Supt., San Antonio Machine Supply Co.

E. M. Le Laurin, Patternmaker, San Antonio Machine & Supply Co.

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H. A. Raby, Salesman, Carl F. Miller & Co.

WESTERN MICHIGAN CHAPTER

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Donald B. Mitchell, Fmn., Coreroom, Lakey Foundry & Mach. Co.

Joseph T. Polack, Fdy. Supv., Campbell, Wyant & Cannon Fdy. Co.

George N. Tarr, Gen. Fmn., Lakey Foundry & Mach. Co.

Walter J. Way, Cost Analyst, Lakey Foundry & Mach. Co.

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Davis B. Milward, Pres., Milward Alloys, Inc.

WISCONSIN CHAPTER

Allan B. Beach, Student, University of Wisconsin

Richard J. Haffeman, Student, University of Wisconsin.

Arthur Hare, Cleaning Room Fmn., Grede Foundries, Inc.

Ronald L. Ruetz, Met., Belle City Mall. Iron Co.

Carl F. McWithey, Appr., Falk Corp.

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Robert Reinthaler

MIT

J. Dixon Chanley   David F. Springsteen

Robert L. Lord

OHIO STATE UNIVERSITY

Jerrold S. Newman   John W. Turner

PENNSYLVANIA STATE COLLEGE

Richard H. Haupt

OUTSIDE OF CHAPTER

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Raoul Meunier Castelain, Fdy. Tech. Engr., Fabrica Cemento "El Melon," La Calera, Chile.

Italy

Giuseppe Ziliani, Ing. Instituto Scientifico Tecnico E Breda, Sesto S. Giovanni, Milan, Italy.

Africa

Bernhard Kremer, Managing Dir., All Metal Founders, Ltd., Bulawayo, So. Rhodesia.

A. F. S. CHAPTER DIRECTORY

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BRITISH COLUMBIA CHAPTER *Secretary-Treasurer*, W. R. Holeton, British Columbia Research Council, University of B.C., Vancouver, B.C., Canada.

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UNIVERSITY OF MINNESOTA *Secretary-Treasurer*, Gerald A. Sporre

MISSOURI SCHOOL OF MINES *Secretary*, Joe L. March

OHIO STATE UNIVERSITY *Secretary-Treasurer*, Edward J. Bazel

OREGON STATE COLLEGE *Secretary*, Leonard M. Preston

TEXAS A & M COLLEGE *Secretary*, W. E. Johnston

UNIVERSITY OF ALABAMA *Secretary*, Richard E. Ray

NORTHWESTERN UNIVERSITY *Secretary-Treasurer*, Robert Ball

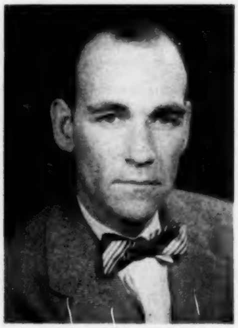
PENN STATE COLLEGE *Secretary*, Ronald Altobelli

FOUNDRY Personalities

Max Kuniansky, past National President of the American Foundrymen's Society and A.F.S. McFadden Gold Medalist, has been promoted from vice-president and general manager to excutive vice-president and general manager of Lynchburg Foundry Co., Lynchburg, Va. Simultaneously, it was announced that **Lloyd C. McNeill** has been named assistant general manager.

R. C. Hocking and Stanley G. Urane, Broken Hill Pty. Co., Ltd., Port Waratah, Newcastle, Australia, are making a three-month study of steel foundry practice in several United States and Canadian foundry centers, stopping in Chicago, Pittsburgh and vicinity, and Toronto. The Broken Hill steel foundry is an auxiliary of the organization's pig iron and ferroalloy producing facilities and makes repair and maintenance castings in both acid and basic open hearth steel. The company's other foundries produce ingot molds, stools, etc., from blast furnace metal, and bearings, bosh plates, and other copper-base alloy castings.

James M. Knox and **Carl W. Hedberg** have been named vice-presidents of the Research Corporation, New York. Mr. Knox, who was formerly business manager and assistant director of Brookhaven National Laboratories, has been named financial officer in addition to his duties as vice-president. Mr. Hedberg, who was formerly head of Research Corp.'s engineering and construction division, will be in charge of operations at the Bound Brook, N. J., plant.



R. J. O'Connor

R. J. O'Connor has been promoted from manager of standards to foundry superintendent. He has been with Cooper Alloy for six years and prior to that was a time-study engineer for American Brake Shoe Co. **John J. Ford,** formerly timestudy engineer, succeeds Mr. O'Connor as manager of standards. Like his predecessor, he came to Cooper Alloy from American Brake Shoe six years ago.

William G. Ferrell, formerly general works superintendent, Auto Specialties Manufacturing Co., St. Joseph, Mich., has been appointed vice-president in charge of manufacturing for that organization. Mr. Ferrell is a past chairman of the A.F.S. Michiana Chapter and has been a frequent speaker at A.F.S. meetings.

John C. Wallace has been named chief engineer for the newly-created diesel engine parts research and development division, and **Paul A. Cahill** has been appointed priorities and materials allocation coordinator for Hunt-Spiller Mfg. Corp., Boston. Mr. Wallace was formerly with Baldwin-Lima-Hamilton Corp., and Mr. Cahill was standards section manager for Hunt-Spiller Mfg. Corp.

L. W. Eastwood, assistant supervisor, Battelle Memorial Institute, Columbus, Ohio, who supervised filming of the A.F.S. research films *"Fluid Flow in Transparent Molds—I and II,"* under the direction of the Aluminum & Magnesium Division's Research Committee, has left Battelle to become assistant director of research for Kaiser Aluminum & Chemical Co., Spokane, Wash. A frequent speaker before A.F.S. chapters, regional conferences and conventions. Mr. Eastwood is author of *Introduction to Metallography* and has written extensively for the technical press.

John Ford

F. B. Rote, associate professor in the University of Michigan's department of Metal Processing, has resigned to become manufacturing control manager for the Albion Malleable Iron Co., Albion, Mich. While at Michigan, Dr. Rote was in charge of both the A.F.S. Malleable and Brass & Bronze Division research projects, and is currently a member of the Sand Division's Committee 8-J and Gray Iron Division's Test Bar Design Committee.

Addison Maupin has been appointed development engineer specializing in the application of refractory products in the iron and steel industries for the Chas. Taylor Sons Co., Cincinnati. A graduate in ceramic engineering from North Carolina State College in 1938, Mr. Maupin worked in the operating and sales departments of General Refractories Corp. until 1947, with four years' leave of absence for Army service in the Pacific. He has had some three years as ceramic engineer with Republic Steel Corp. Mr. Maupin will make his headquarters at Chas. Taylor Sons Co.'s Cleveland district offices.

R. A. Gloss has been named sales representative in the Wisconsin and Michigan Upper Peninsula territory of Federated Metals Div., American Smelting & Refining Co. Mr. Gloss, who has been with Federated for the last year undergoing intensive sales training at its Whiting, Ind., plant, will work out of Federated's district sales office at 756 North Milwaukee St., Milwaukee, Wis.

Henry Kleifgen is president of the newly-formed Admiral Die Casting Corp., Chicago. Mr. Kleifgen was formerly production manager of Central Die Casting & Manufacturing Co., Inc., Chicago.

Henry Kleifgen

A. J. Steffens, Jr., has been appointed sales engineer for the Osborn Manufacturing Co., Cleveland, and will cover North and South Carolina, eastern Georgia and Florida. Mr. Steffens holds a degree in business administration.

Walter C. Bladin has been named assistant to the vice-president of Burnside Steel Foundry Co., Chicago. Mr. Bladin, who attended Chicago Technical College and Armour Institute has been with the company for 25 years.

W. C. Bladin

Ernest Fields and **Clarence White, Sr.**, have been placed in charge of molding room and core room operations, respectively, for Sterling Casting Corp., Bluffton, Ind. Mr. Fields has 25 years and Mr. White 40 years' experience in the foundry.

J. S. Groh has been appointed sales representative for the Foundry Products Division of Archer-Daniels-Midland Co. and will make his headquarters at the company's Chicago office. Mr. Groh began his foundry career in 1938 as an apprentice

J. S. Groh

with Hansell-Elcock Co., Chicago, while studying metallurgy at Illinois Institute of Technology. He became metallurgist, foundry foreman and assistant superintendent there, before joining Nordberg Mfg. Co., his previous position.

Kenneth Jensen succeeds new Board Chairman **Eugene C. Bauer** as president of Kensington Steel Co., Chicago alloy steel casting affiliate of Poor & Co., railway equipment firm. Also elected are **Eugene C. Bauer, Jr.**, first vice-president;

Kenneth Jensen

Edmund C. Anderson, vice-president and sales manager; **Roy W. Sergeant**, treasurer and assistant secretary; **Anthony J. Frystack**, secretary; and **H. M. Albers**, sales manager of the company.

(Continued on Page 90)

THIS MONTH'S AUTHORS

Victor Paschkis, Austrian-born and educated author of *"Heat Transfer—the Invisible Foundry Tool"* on Page 22 is author of this year's A.F.S. Exchange Paper to the Institute of British Foundrymen, of which the article is an excerpt. Dr. Paschkis is in charge of Columbia University's Heat and Mass Flow Analyzer Laboratory, where he is conducting the A.F.S. Heat Transfer Committee's Research Project.

Alfred J. Howarth, whose article, *"Gating Principles Applied to Gray Iron Castings Produced on Match Plates,"* is on Page 28, wrote on gating aluminum alloys in the August, 1950 issue. Interested in foundry gating and risering problems for many years, he has made many appearances before foundry groups discussing that subject and such related topics as sand control. In his off hours, Mr. Howarth is interested in gun collecting and theatricals.

Alexander D. Barczak, author of *"Records Are Basis of Quality Control in Smaller Foundry,"* Page 46, has spoken before meetings of the Society on such divergent topics as molding principles, use of synthetic sands and sources of metal losses in recent years. Chairman of the A.F.S. Cincinnati District Chapter, while with the Bardes Forge & Foundry Co. in that city, he is now plant manager for Superior Foundry, Inc., Cleveland.

Collaborators on the article, *"Cast Stainless Steel in Ceramic Molds,"* Page 38, worked together at the University of Illinois last year to develop this new process. Two of the authors, **R. L. Cook**, professor of ceramic engineering, and **Harry Czyzewski**, assistant professor of physical metallurgy, are still on the faculty of the University, but co-authors **P. H. Frederick** and **J. P. Jero**, who worked on development of the process as students, are now with the Caterpillar Tractor Co. and the Army Air Force, respectively. Mr. Czyzewski, an Illinois alumnus, was for a time head of Metallurgical Engineers, Inc., Portland, Ore., but returned to the University as a faculty member and to work out advanced metallurgical problems.

Harry W. Dietert and **Alex L. Graham**, co-authors of *"Core Strength Variations Due to Oven Humidities,"* Page 58, are both with the Harry W. Dietert Co., Detroit—Mr. Dietert as president and Mr. Graham as research engineer. One of the A.F.S. Sand Division's most active members since its inception in 1921, Mr. Deitert received the A.F.S. Wm. H. McFadden Gold Medal in 1940 for his work in promoting interest in foundry sand research and control. He is today an A.F.S. National Director-Elect.

Henry W. Zimnawoda, Polish born author of *"Modern Foundry Methods—Mechanizing Medium-Sized Gray Iron Foundries,"* Page 40, might be called an international foundryman, having worked in foundries in Poland, France, Brazil and the United States. Because of his multilingual talents and his reputation as an authority on foundry mechanization, Mr. Zimnawoda was chosen to present the A.F.S. Official Exchange Paper at the annual meeting of the French Foundry Technical Society early this summer. His article in this issue of AMERICAN FOUNDRYMAN is a pictorial excerpt from that paper.

authors of *"Mechanical Engineer in the Foundry,"* Page 60, are department head and professor, respectively, of Michigan State College's department of mechanical engineering. Professors Price and Sigerfoos have both been extremely active in working with the Foundry Educational Foundation in promoting the castings industry at the college level. Their article in this issue is one of several papers presented at the Foundry Educational Foundation's recent meeting between educators and industrialists. Professor Sigerfoos is a past chairman of the A.F.S. Central Michigan Chapter and is a member of the Sand Division Mold Surface Committee.

J. E. Rehder, who describes *"Applying Research Findings in the Malleable Iron Shop,"* on Page 51, is foundry engineer for Canada's Department of Mines and Resources, Ottawa. A tireless worker in the field of foundry research, Mr. Rehder has frequently reported the results of his findings in AMERICAN FOUNDRYMAN and has appeared before many A.F.S. Chapters as a speaker on a wide range of foundry subjects. While a metallurgical engineering student at Toronto's McGill University, Mr. Rehder won a Dawson Memorial Fellowship and the local ASM chapter's prize for a thesis in metallography. Prior to joining the Bureau of Mines in 1947, he was assistant manager of Bowmanville Foundry Co., Ltd., and chief metallurgist for Grinnell Co. of Canada, Ltd. He is a member of the A.F.S. Educational Division's College Research Projects Committee.

These 12 members of the newly-formed A.F.S. Northwestern University Student Chapter came from nearby Evanston to attend the May meeting of the A.F.S. Chicago Chapter, held at the Chicago Bar Association.

CHAPTER ACTIVITIES NEWS

Central New York

James W. Ogden
Cleveland Tramrail Syracuse Co.
Publicity Chairman

MORE THAN 100 MEMBERS and guests of the Chapter met at Statler Hall on the Cornell University campus April 13 to honor the late Dr. Heinrich Ries posthumously for his outstanding work in the field of foundry sand research.

Dr. Ries, who was to have celebrated his 80th birthday on April 30, died just two days before he was to have received a commemorative plaque in person from the Chapter. He had been looking forward to this meeting with great anticipation, and while the Chapter was shocked and grieved over his death, it is grateful that its intentions brought happiness to him in his final days. At the meeting, which was held as Dr. Ries would have had it, the members and guests paid homage to their eminent fellow member, and the plaque prepared by the Chapter was presented to members of his family.

Dr. Ries' entire life was devoted to teaching and research and many honors and degrees were conferred upon him for his work as head of Cornell University's Geology Department and for his long-time service as chairman of the A.F.S. Sand Division and as an active worker in ceramics technical societies. Author of many books and technical papers of great value in the fields of foundry sands and clays, geology, mineralogy and ceramics, Dr. Ries was awarded the A.F.S. Seaman Gold Medal and Honorary Life Membership in the Society.

E. C. Zirzow of John Deere Co., Moline, Ill., speaker at the regular technical meeting of the Chapter that evening on *"Review of the Development and Practical Application of Sand Tests,"* and an associate of Dr. Ries on the Sand Division's Executive Committee, also paid tribute to him.

Smiling group photographed during the recent Texas Regional Foundry Conference included, left to right: Program Chairman John H. Kimes, Jr., Lufkin Foundry & Machine Co., Lufkin; Conference Chairman James R. Hewitt, James R. Hewitt Co., Houston; Chapter Vice-Chairman John Bird, American Brass Foundry, Fort Worth; Guest Speaker Bruce L. Simpson, National Engineering Co., Chicago; Chapter Director Malcolm Henley, Texas Foundries, Inc., Lufkin; Chairman W. H. Lyne, III, Hughes Tool Co., Houston; and Chapter Directors Jack O. Klein, Texas Foundries, Inc., Lufkin, and Israel Smith, Western Foundry Co., Tyler.

Eastern New York

Leigh M. Townley
Adirondack Foundries & Steel, Inc.
Vice-Chairman

MAY 15 MEETING's round table discussion turned out to be one of the liveliest of the year as Howard Nye of Crompton-Knowles Loom Works, Worcester, Mass., headed a discussion of many phases of casting.

Mr. Nye opened the discussion by describing a particular problem which arose in his own company and the steps which were taken to meet it.

From that point on, the discussion branched out to take in such foundry topics as operation, cost analysis, personnel problems, apprentice and foreman training courses.

Annual election of officers took place during the meeting. New officers are: *Chairman,* John Waugh, General Electric Co.; *Vice-Chairman,* Leigh M. Townley, Adirondack Foundries & Steel Co.; and *Secretary-Treasurer,* Edward Lawrence, General Electric Co.

Chicago

Dean Van Order
Burnside Steel Foundry Co.
Chapter Reporter

MAY MEETING, last of the season, attracted one of the largest turnouts of the year, including 12 members from the newly-formed Northwestern University Student Chapter.

Retiring Chairman C. V. Nass, Beardsley & Piper Div., Pettibone Mulliken Corp., announced officers for 1951-52: *Chairman,* Walter W. Moore, Burnside Steel Foundry Co.; *Vice-Chairman,* John Owen, Harbison-Walker Refractories Co.; and *Secretary,* Robert Doelman, Miller & Co. New directors are: Walter Bolton, Link-Belt Co.; Frank S. Flynn, S. Obermayer Co.; and Theodore Haines of Howard Foundry Co.

Chapter meeting was devoted to round table discussions and was divided by group interest.

Non-Ferrous and Pattern Division, with Fred Riddell as chairman, had as its speaker Richard Ligocki, Hammond Brass Works, Hammond, Ind., who discussed *"Advanced Design of Pattern and Core Box Equipment for Production Foundries."*

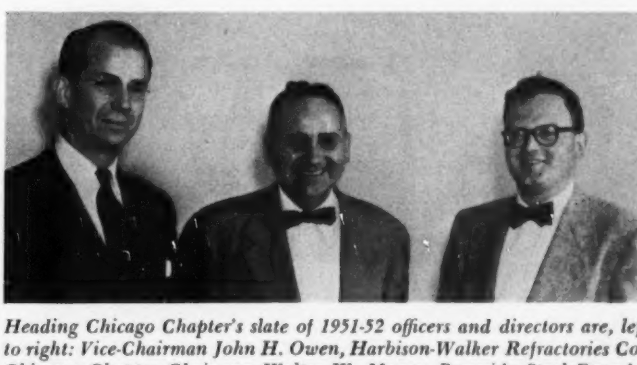
Steel Division, under the chairmanship of Robert P. Schauss, Illinois Clay Products Co., heard Samuel Belus, Burnside Steel Foundry Co., John Barney, National Malleable & Steel Casting Co., and William Wick, Beardsley & Piper Div., Pettibone Mulliken Corp., Chicago, speak on *"Successful Gating and Risering Techniques."*

Gray Iron Division's subject was *"Analysis and Specifications per Casting Section,"* with Theodore Haines, Howard Foundry Co., as speaker and Leroy E. Taylor, Goebig Mineral Supply Co., as chairman.

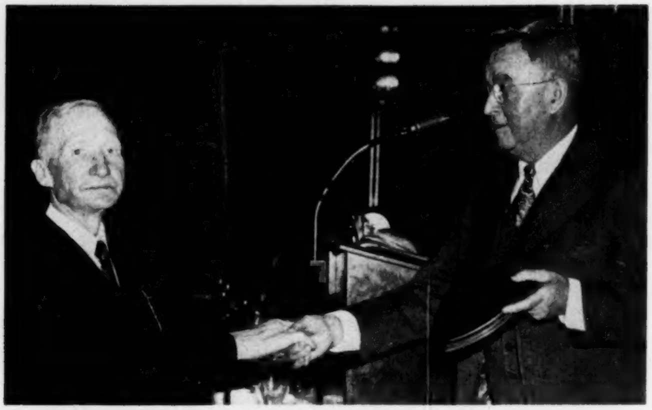
Malleable Division continued its

Lawrence D. Pridmore, International Molding Machine Co., LaGrange Park, Ill., stresses a point during Southern California Chapter's recent Core Blowing School, held at Compton Foundry, Compton, Calif. Looking on at right is Arrangements Chairman James Barr of Compton Foundry Co.

Responsible for the success of Southern California Chapter's recent Core Blowing School, held at Compton Foundry, Compton, Calif., May 9 and 10 were, left to right: Paul Koenig of Mastercraft Patterns; James Barr of Compton Foundry Co.; Principal Speaker Lawrence D. Pridmore, International Molding Machine Co., LaGrange Park, Ill.; William Emmett of Los Angeles Steel Casting Co.; and Ray Silva of Fairbanks, Morse & Company.

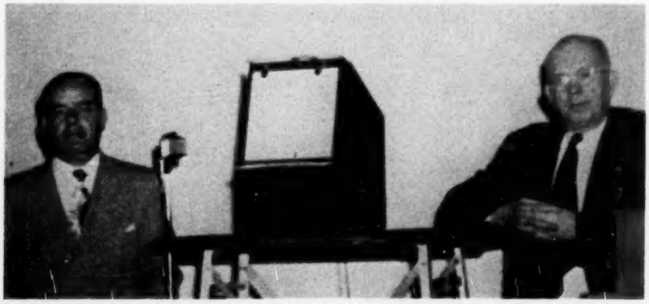


Heading Chicago Chapter's slate of 1951-52 officers and directors are, left to right: Vice-Chairman John H. Owen, Harbison-Walker Refractories Co., Chicago; Chapter Chairman Walter W. Moore, Burnside Steel Foundry Co., Chicago; and Secretary Robert Doelman of Miller & Co., Chicago.



Old Timer J. Smith (left) receives his 50-year service plaque for the first time from Wisconsin Chapter's Old Timers Committee Chairman Charles Zahn, Vilter Mfg. Co., during the chapter's Old Timers and Apprentices Night, May 11. (Photo: W. V. Napp, Badger Fire Brick & Supply).

Wisconsin Chapter's Retiring President Walter W. Edens, Badger Brass & Aluminum Foundry, Milwaukee, (left) presents gavel to Incoming President George Tisdale, Zenith Foundry, Inc., Milwaukee, at the May 11 meeting. (Photograph courtesy of Walter V. Napp, Badger Fire Brick & Supply Co.)



Harold Ullrich, Sacks-Barlow Foundries, Inc., Newark, N. J., (left) leading a round table discussion by Philadelphia Chapter's gray iron foundrymen's group at the Chapter's May 11 meeting. Assisting him at right is Program Chairman George H. Bradshaw of Philadelphia Naval Shipyard.

round table discussion clinic, headed by Robert McCluskey, National Malleable & Steel Castings Co., assisted by Anthony Raiman, Illinois Malleable Iron Co.; Al Friberg, International Harvester Co.; L. K. Hooper, Crane Co.; and James Fraser, National Malleable & Steel Castings Co. Subject was *"Finishing Quality Control."*

Cincinnati District
Marvin L. Steinbuch
The Lunkenheimer Co.
Chapter Reporter

SAFETY PROGRAM, *"Let's Pretend,"* was presented at the May meeting by E. F. Chittenden and George A. Zang of Toledo, Ohio.

"Let's Pretend" is a psychological approach to the industrial problem of eye protection, convincing each participant that eyesight is really God's greatest gift and of the importance of adequate eye protection.

After a brief talk on safety, the audience was blindfolded, taken into the "land of make-believe" and, step by step, previewed a day in the life of a blind person. The narrator instructed and aided the audience in using tooth powder on a tooth brush, lighting a cigarette, and many other everyday manipulations. Needless to say, the participating audience was deeply impressed.

Tennessee
Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

REGULAR DINNER MEETING was held at the Hotel Patten May 25, with approximately 50 members and guests present.

The following officers were elected for the coming year: *Chairman,* Porter Warner, Jr. Porter Warner Industries, Inc., *Vice Chairman,* W. M. Hamilton, Crane Co.; *Secretary and Treasurer,* Richard Kirchmayer, Sterling Wheelbarrow Co.

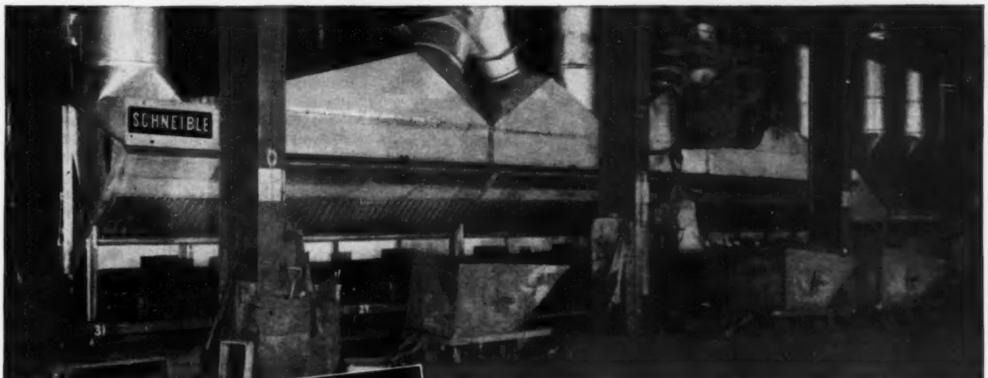
Paul L. Arnold, U.S. Pipe & Foundry Co., retiring chairman, read a report of activities for the past year and extended his thanks to the members.

Porter Warner, Jr., incoming chairman, made a speech of acceptance on taking over the gavel from Mr. Arnold, and pledged that he would do his best to make the coming year an excellent one for the chapter.

The grand drawing on the Building Fund Raffle was held, and the cash prize of $200.00 was won by Mrs. Browning of the Browning And Hamilton Co.

Following the raffle was a quiz program on *Casting Defects,"* and the following persons received the highest grade of 19. J. D. Martin, Combustion Engineering Corp.; Don Andrews, Mueller Corp.; Charles Chisholm, Whe-

(Continued on Page 75)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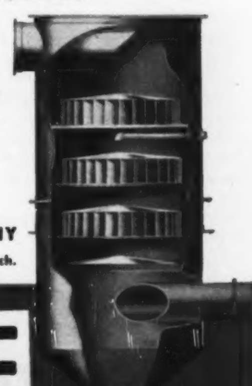


when you need CORE BOX PROTECTION ...it's MARTIN

Every Martin product is designed especially for "core box protection"—each is built to prevent a specific type of wear on your core boxes. They are engineered by foundry men to assure easy installation, successful operation. Martin products add years to the life of your equipment by enabling you to salvage old plates and core boxes, by preventing abrasion, and giving your plywood blow plates the lasting qualities of steel. Each product carries a guarantee of absolute satisfaction.

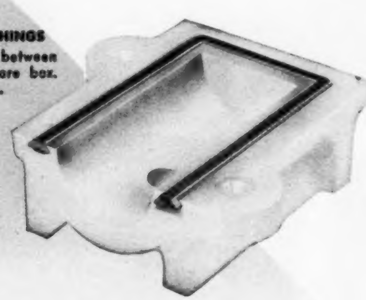
Martin products are manufactured under United States and foreign patents and distributed all over the world by foundry supply houses.

"PROTEXABOX PINS"
Cannot mar the box face because they will not loosen. Protective rubber tip guaranteed to stay on.

"SAND ARRESTER TUBE"
Save cores and step up production. Guaranteed for 100,000 blows.

"HOLINER" BUSHINGS
Stop abrasion between blow plate and core box. Protect blow holes.

"PULLINSERT" BLOW BUTTONS
Positively stop sand blasting under blow holes. Available in nine popular sizes.



"STRIPINSERT"
Protects parting line—easily installed in old or new boxes. Cutters for groove available at moderate cost.

"VIBROLATOR"

The powerful all-directional vibration of the Peterson Vibrolator makes this an ideal unit for keeping materials flowing in chutes or hoppers. The Vibrolator will not crack attaching lugs on match plates or core boxes. Instantly self starting and virtually noiseless in operation, this new type vibrator eliminates maintenance worries and gives a long, dependable service life. No lubrication is necessary. The Vibrolator is light in weight to lessen fatigue and permit maximum delivery of vibration. There are five sizes available to meet all your foundry requirements. Peterson Vibrolators are sold only by Martin, exclusive manufacturers of ball-type vibrators.

"VIBROLATOR"

See your foundry distributor or write for folders describing these Martin products in detail. If you have a sand movement problem, send us complete information and our engineers will prescribe the correct vibrator for your needs.

MARTIN ENGINEERING COMPANY
KEWANEE 1, ILLINOIS

land Co.; Paul Stuff, Ross Meehan Foundries, Inc.; Arden Imm, Combustion Engineering Corp.; Albert Waller and David L'Heureux of Ross Meehan Foundries, Inc.

Quad City

E. C. Zirzow
Deere & Co.
Publicity Chairman

MAY 21 MEETING speaker was Frank G. Steinebach, Penton Publishing Co., Cleveland, who in his talk *"What's Ahead"* told of what transpired in various government bureaus during World War II with regard to foundry supplies such as coke, scrap, pig iron, alloys and equipment.

He stated that the procurement and allocation of these materials was left to unqualified government employees and that by war's end this condition had been rectified to some extent by foundry groups. One lesson the foundrymen learned, he said, was the need for acting as a single unit and not to try to function as separate interest groups.

Korea came too soon, Mr. Steinebach continued, to permit the desired organization of the various foundry groups into a compact unit. Hence, some of the problems encountered in World War II still exist in the new defense setup. However, he added, foundry groups as a whole are in a better position to cope with these problems than they were at any time during World War II.

The speaker said that U. S. foundrymen will be affected by whichever of three methods of conducting the Korean war is decided upon by the government: (1) continue with the present limited war—in this case the total foundry tonnage will be heavy and divided between defense and civilian

Engaging in post-meeting shoptalk at Eastern New York Chapter's May meeting were, left to right: Chapter Chairman Leo Scully, Scully Foundry & Machine Co.; Speaker Howard Nye, Crompton & Knowles Loom Works, Worcester, Mass.; and D. S. Yeomans, Geo. F. Pettinos, Inc., New York, chairman of the A.F.S. Metropolitan Chapter, honored guest at the meeting.

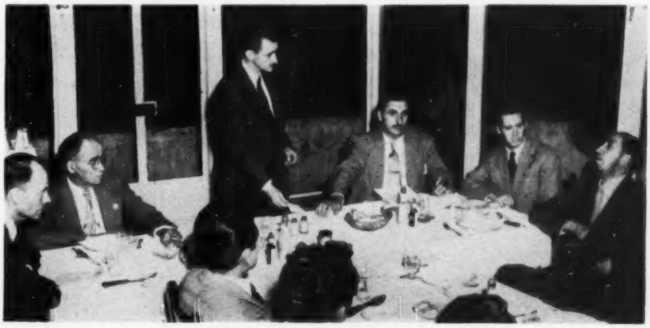
Speakers' table notables photographed at Eastern Canada Chapter's May 11 meeting included, left to right: Retiring Chapter Chairman Lucien Guilmette, Canadian Foundry Supplies & Equipment, Ltd.; Marc Boyer, Deputy Minister, Department of Mines and Technical Surveys, Ottawa, Ont.; and I. R. Wagner, Vice-President of the American Foundrymen's Society.

CHAPTER MEETINGS

- ***JULY 30***
TWIN CITY
Midland Hills Golf Club, St. Paul
ANNUAL GOLF PARTY

- ***SEPTEMBER 24***
NORTHWESTERN PENNSYLVANIA
Moose Club, Erie
TECHNICAL MEETING
Speaker to be announced

- ***SEPTEMBER 25***
MICHIANA
Tabor Farms, Sodus, Mich.
ANNUAL PICNIC



Deep in discussion during Mexico City Chapter's May meeting were the following speakers' table occupants, from left: Secundino Ruiz, Sr.; Francisco Madrigal; Chapter Vice-President (standing) Juan Latapi; Chapter President Nicolas S. Covacevich; Chapter Secretary Francisco Diaz Covarrubias and Fernando Gonzalez Vargas, past president of the chapter.

CHAPTER ACTIVITIES

(Continued from Page 75)

production; (2) all out war—when production will be heavy and devoted solely to defense needs; and (3) sudden peace. All of these possibilities, the speaker said, will be tough on the foundry industry.

Birmingham District

J. P. McClendon
Stockham Valves & Fittings, Inc.
Publicity Chairman

ABOUT 100 FOUNDRYMEN attended the May 18 meeting, featuring the annual Quiz Program. Quizmaster T. H. Benners, T. H. Benners & Co., presided and a corps of experts answered questions from the floor on any subject related to casting of metals.

Experts and their respective fields were:; W. W. Austin, Southern Research Institute, *Nodular Iron and Machinability;* Frank H. Coupland, American Cast Iron Pipe Co., *Foundry Practice and Sand Control;* Ray L. Farrabee, Central Foundry Co., *Foundry Metallurgy;* Robert L. Jones, Pressure Cast Products Co., *Pressure Castings;* Fred E. Vann, Stockham Valves & Fittings, Inc., *Foundry Engineering;* W. A. Langford, East Birmingham Foundry Co., *Non-Ferrous;* H. E. Montgomery, Alabama Pattern Works, *Patterns;* and Hammond Wood, Alabama By-Products Corp., *Coke and Cupola Operations.*

Questions were asked about the shell-molding process, nodular iron, synthetic molding sand, chill tests, foundry equipment, patterns, coke quality, and many other subjects in an effort to "stump the experts."

As is chapter custom, annual election of 1951-52 officers was held. They are: *Chairman,* Charles K. Donoho, American Cast Iron Pipe Co.; *Vice-Chairman,* Fred K. Brown, Adams, Rowe & Norman, Inc., and *Secretary-Treasurer,* John Drenning, Kerchner-Marshall & Co.

Newly elected officers of the A.F.S. Massachusetts Institute of Technology Student Chapter pose with A.F.S. National Vice-President I. R. Wagner at the Chapter's May 9 meeting. From left: Chapter Technical Secretary Dix Chandley, President Jerry Poirier, Mr. Wagner, Chapter Vice-President John Lynch and Chapter Secretary-Treasurer Bob Murphy.

Northeastern Ohio

Robert H. Herrmann
Penton Publishing Co.
Publicity Chairman

SOME 337 MEMBERS and guests turned up at the Chapter's Old Timers and Apprentices Night, April 12 to honor 150 foundrymen with 40 or more years of foundry service.

Apprentice winners in the local contest were announced and received prizes of $25, $15, and $10 for first, second, and third place in each division. Molding division winner was Donald Hinman, Hill Acme Co. Michael E. Sedlak, Hill Acme Co., was second, and Donald Marinelli, Fulton Foundry & Machine Co., was third.

In wood patternmaking, first prize went to Fred Fiorentini, Modern Pattern Co., second to Donald A. Siebert, Royal Pattern Works, and third to Eugene Chmielowicz, Motor Patterns Co. James Gaino, Royal Pattern Works, was the only entrant in metal patternmaking and his work was deemed worthy of first prize.

Chapter officers and directors were nominated for the coming year. They are: *President*—Gilbert J. Nock, Nock Fire Brick Co.; *vice president*—Frank C. Cech, Cleveland Trade School; *secretary,* R. D. Walter, Archer-Daniels-Midland Co., and *treasurer*—F. Ray Fleig of the Smith Facing & Supply Company.

Directors for three years are: Harold Strater, North American Refractories Co.; Walter Quayle, National Malleable & Steel Castings Co.; Alexander D. Barczak, Superior Foundry Inc.; George Clifford, Fulton Foundry & Machine Co., and George E. Miller, Osborn Mfg. Co.

Frank G. Steinebach, Penton Publishing Co., spoke at the May 24 meeting. In his talk, *"What's Ahead,"* Mr. Steinebach discussed current Washington developments relating to the foundry industry. He pointed to the government's realization that castings are basic to industry—a lesson learned from World War II. Consequently, foundries are getting a better break in industry regulations associated with current defense preparations.

He also spoke of the fine co-operation among foundry industry societies

(Continued on Page 78)

Social hour preceding Northern California Chapter's March meeting was enjoyed by (left to right): James Rimmer, Columbia Steel Co.; Past Chapter President Ralph Noah, San Francisco Iron Foundry; Arthur Klopf of Great Lakes Carbon Corp.; and Speaker J. A. Gitzen, Delta Oil Products Co., Milwaukee. (Photo: Pen DeRoche, Western Machinery & Steel World.)

CHAPTER ACTIVITIES

(Continued from Page 75)

in presenting their problems to Washington agencies and stressed the importance of even greater co-operation. He stated that the foundry advisory committees are the second best organized group of the Munitions Board.

This meeting also honored past chapter presidents and national officers. Walter L. Seelbach, Superior Foundry Inc., Cleveland, and national AFS president-elect, gave a brief talk.

Eastern Canada

Lucien Guilmette
Canadian Foundry Supplies & Equipment, Limited
Past Chapter Chairman

Annual business meeting of the Chapter, held on May 11, had as its honored guest, A.F.S. National Vice-President Elect I. R. Wagner, who spoke on the aims of and policies of the Society. Also attending as honored meeting guests were Marc Boyer, Deputy Minister of the Canadian Department of Mines and Technical Surveys, Ottawa, and Dr. John Convey and N. C. MacPhee, also of the Department of Mines.

Southern California

S. L. Jackson
Electro Metallurgical Co., Division of Union Carbide & Carbon Corp.
Publicity Chairman

May meeting was held at the concluding session of the Chapter's school on core blowing on May 11. First two sessions of the school were held May 9 and 10 and were conducted at Compton Foundry, Compton, Calif.

Committee for this school was guided by Chairman James Barr, Compton Foundry Co. Members of the committee were: Lawrence Pridmore, International Molding Machine Co.; LaGrange Park, Ill.; William Emmett, Los Angeles Steel Casting Co.; Paul Koenig, Mastercraft Pattern Co.; Leonard Hofstetter, Brumley-Donaldson Co.; and Ray Silva, Fairbanks, Morse & Co. A large group, averaging 200 each night, attended the school. The Chapter appreciates the use of Compton Foundry in conducting this school, and the work of Mr. Barr and his committee.

The first session of the school was conducted by William Emmett of Los Angeles Steel Casting Co., who described and exhibited the different types of wood and metal coreblowing boxes used in the foundry. During the second evening, L. D. Pridmore of the International Molding Machine Co., Paul Koenig of Mastercraft Pattern Co., and Ray Silva of Fairbanks, Morse & Co. showed different types of boxes and described preferred methods of blowing and venting core boxes. Three

coreblowing machines were set up and several cores were blown, using core boxes with which several of the foundrymen were having trouble and had brought to determine the reasons for their difficulties.

Mr. Pridmore was the speaker on the third night. He exhibited different types of blow box accessories and explained where they were most applicable. He stated that the first thing to remember in blowing cores is that you must replace air with sand. Therefore, proper and sufficient vents are required. He said that it is also wise to use as large a blow hole as possible, as this minimizes the rifling action of the sand, resulting in longer life of the boxes. The speaker discussed the types of sand mixes, synthetic and natural bonded, in reference to the subject matter.

In attendance at the final meeting were a large group of students and their instructors to conclude a very successful participation in the activities of the Chapter's Educational Committee. E. K. Smith, chairman of the committee, and John Wilson, chapter president, presented cash prizes to John Schroeder, Los Angeles Trade-Technical College and Daniel R. Lucero, of the East Los Angeles Junior College. Instructors of these first and second prize winners are Miss Emma Beekman, chairman of the Academic Dept., and C. Guse, head of Engineering, for the respective colleges. This year, each contestant wrote an essay or paper on any foundry subject of his own choice.

MIT

Dix Chandley
Technical Secretary

MIT Student Chapter ended one of its most successful years with the May 9 meeting. A.F.S. National Vice-President Elect I. R. Wagner was present for the informal dinner and meeting, held in the school's foundry.

After dinner speakers were two MIT graduates, Robert Savage of International Nickel Co. and Thomas McLeer of Cooper Alloy Foundry Co., who related interesting and humorous experiences encountered in their first year after leaving MIT.

Summarizing the year's activities, this Student Chapter's chief activity is its monthly dinner, with prominent members of the foundry industry as speakers. The Chapter helps finance and operate the school's experimental foundry, since almost all Chapter members participate in its operation. Chief activity of the experimental foundry is its weekly melt in one of its two 28-in. cupolas.

At this run many new ideas are tried. Projects for the last year included shrinkage in shaper blocks under a

variety of molding conditions; a study of the effect of riser-therms on gray iron castings; analysis of gases above the cupola melting zone; training in new molding techniques; and drying mold faces by spraying and ignition.

The melting operation is done entirely by students, from relining of the cupola to sweeping up the last grain of sand. During the year both electric arc and induction furnaces were operated by the students.

New officers of the Student Chapter are: *President,* Gerald Poirier; *Vice-President,* John Lynch; *Secretary-Treasurer,* Robert Murphy; and *Technical Secretary,* Dix Chandley.

Philadelphia

G. H. Bradshaw
Philadelphia Naval Shipyard
Chapter Vice-Chairman

Last meeting of the season was held May 11 at the Engineers Club with 125 members and guests attending. Round table discussion topics for the meeting dealt with both ferrous and non-ferrous founding problems, thus the various groups combined in a single round table discussion instead of the usual separate group discussions.

Steel Discussion Leader Daniel Talbot, Cooper Alloy Foundry Co., Hillside, N. J., did a commendable job of demonstrating various steel casting problems, using sample castings and x-rays as illustrations.

Discussion leader for Gray Iron was Harold Ullrich of Sacks-Barlow Foundries, Newark, N. J., while Non-Ferrous discussion was led by Roger Keeley, H. Kramer & Co., Philadelphia, who talked on problems presented at the Brass & Bronze Round Table Luncheon at the 1951 A.F.S. Convention.

Chapter Vice-Chairman G. H. Bradshaw, Philadelphia Naval Shipyard, was technical chairman.

Western New York

Marve Taublieb
Frederic B. Stevens, Inc.
Publicity Chairman

Annual Election of 1951-52 officers and directors was a feature of the May 10 meeting, held at the Hotel Sheraton, Buffalo. Elected were: *Chairman,* Erwin Deutschlander, Worthington Pump & Machinery Corp.; *Vice-Chairman,* Carl A. Harmon, Hanna Furnace Corp., *Secretary* (re-elected), Roger E. Walsh, Hickman, Williams & Co.; and *Treasurer,* Martin W. Pohlman, Pohlman Foundry Co.

Directors: William P. Quinn, Pratt & Letchworth, Inc.; Joseph Zahm, Master Pneumatic Tool Co.; Leonard Greenfield, Samuel Greenfield Co.; and Alfred A. Diebold, Atlas Steel Castings Co. (one year term).

Retiring Chairman Diebold thanked committee heads, officers and members

(Continued on Page 83)

NEW · Foundry · Products

For additional information on New Products, use postcard at bottom of this page.

Primer

1—Carboline Rustbond Primer, containing a new vehicle, is capable of locking paint film, particularly vinyls, to surfaces having adherent rust. Wetting action is evident by its ability to reduce splitting of top vinyl finishes (notorious for peeling from sharp edges) to nearly zero. Primer has shown evidences of being able to reduce portions of rust particles from iron oxide to iron after 60 days. Primer performs noticeably better on rusty surfaces than on clean, shiny surfaces and thus does not replace standard primers on new or sandblasted steel. Primer has been found compatible with all types of finishes tried upon it. Finishes cling to it and do not peel. With vinyls, it has been found that a tie-coat containing hydroxyl resins between primer and vinyl top coat gives better results than direct application on the primer itself. Primer also contains such rust-inhibiting pigments as red lead, iron oxide and a new type of chromate salt. *Carboline Co.*

Non-Fermenting Core Wash

2—Mexican Cordip, a non-fermenting core wash, is guaranteed by manufacturer not to sour or form gas bubbles that cling to surface of metal and cause pock marks on drying even in hottest weather. A high-temperature coating made from finest Mexican graphite, Mexican Cordip will not build up or run on core surfaces, allowing both dry and green cores to maintain true dimensions. Cordip penetrates sand and anchors firmly to the core, giving protection in depth that prevents burn-in and remains intact as molten metal churns by. It is highly refractory, providing effective insulation at sand-metal interface and resisting penetration of fluid metal. Unusually thin skinned, Mexican Cordip allows greatest possible accuracy in reproducing the thin core coat, yet performs with the same efficiency as heavier coated washes. *United States Graphite Co.*

Pneumatic Casting Grip

3—CG-2 casting grip is designed to hold medium-sized castings from 2 to 20 in. firmly during cleaning and snagging operations in foundries, regardless of individual shapes. Operated in conjunction with fast swing grinders, CG-2 casting grip is claimed by manufacturer to increase cleaning and snagging capacities greatly and with complete safety to the operator. *Joy Manufacturing Co.*

Dry Chemical Fire Extinguisher

4—Four-lb dry chemical fire extinguisher with rubber hose offers such advantages as ease of operation, flexibility in fighting overhead and ground level fires, and maximum extinguishing effectiveness for inexperienced operators. Operating range is 12 to 15 ft and unit has received a B2, C2 rating from Underwriters' Laboratories. Dry chemical is ejected from unit through fan-shaped stream pressurized by 1½ oz carbon dioxide cylinder. Self-closing nozzle makes unit weather tight. Extinguisher has capacity of 4 lb of dry chemical, weighs 10½ lb and has 15¼-in. hose assembly. *Ansul Chemical Co.*

Emery Armored Floors

5—Emery-Crete floors are claimed by manufacturer to be extremely tough and durable, outlasting ordinary foundry floors, through use of emery as a floor component. Highly resistant to effects of oils, fats, acids and organic wastes, Emeri-Crete floors withstand constant moisture and steam and are not affected by intense heat when mixed with heat-resistant cement, whether from molten metal or furnace heat. Floors containing emery as an aggregate withstand crushing loads up to 14,500 psi without noticeable effect and high tensile strength of 1048 psi increases

(Continued on Page 86)

Reader Service (JULY/51)

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Reader Service

AMERICAN FOUNDRYMAN

616 S. Michigan Avenue

Chicago 5, Illinois

FOUNDRY *Literature*

For additional information on Foundry Literature use postcard at bottom of this page.

Foundry Equipment Catalog

6—40-page illustrated catalog describes the complete line of Bartlett & Snow foundry equipment for all types of foundries. Some 8 pages are devoted to diagrams showing best arrangements of equipment in various types of foundries, while other profusely illustrated sections are devoted to use of equipment in such foundry applications as: shakeout, sand cleaning, sand conditioning, distributing systems, hoppers and gates, flask fillers, mold conveyors, castings handling, dust collection and miscellaneous operations. *C. O. Bartlett & Snow Company.*

Metallographic Polishing

7—Booklet describes Buehler two-speed polishers, available for flush or table mounting and in single, double or triple unit tables. *Buehler, Ltd.*

Sand Blast and Core Knockout

8—12-page bulletin illustrates how Hydro-Sand Blast economically solves core knockout and castings cleaning problems. Photographs and an over-all schematic drawing of a typical installation illustrate the text which describes special features, tells how the externally-operated machine makes a safe easy job out of a difficult one, and tells how the machine is controlled and operated. Engineering specifications give dimensions, plan and front elevations and capacities of two of the machines. *Pangborn Corp.*

Fly Ash Collection

9—4-page illustrated booklet, "What's *New in Fly Ash Collection,*" describes (1) the fly ash problem, (2) size of particles, (3) table on particle size analysis, (4) trend to higher collection efficiencies, (5) electrical precipitators for fly ash collection, (6) dust concentration, (7) new developments in electrical precipitators, (8) continuous rapping, and (9) cabinet electrical sets. Tables and diagrams illustrate the text. *Research Corp.*

Contact Wheel

10—4-page booklet describing the 61 contact wheel for abrasive belt backstand applications claims 50 per cent more belt life for this wheel and elimination of glazing. Photographs of wheel in operation and "before and after" photomicrographs illustrate text, as do comparative performance charts of the 61 contact wheel and standard serrated wheels. *Carborundum Co.*

Pneumatic Equipment Standards

11—"*Pneumatic Standards for Industrial Equipment,*" adopted by the Joint Industry Conference on Pneumatics as desirable quality requirements to be specified by users of pneumatic machinery and equipment, are offered free to engineers, designers and users. Standards are reproduced in full, with simple circuit, glossary of terms, two pages of standard symbols and a comparison of how Miller air cylinders meet these standards are given in this hole-punched booklet. *Miller Motor Co.*

Masonry Cutting

12—Booklet contains practical, illustrated instructions on how to figure blade costs in masonry cutting before starting cutting operations. Designed for use of masonry saw operators, booklet tells (1) how to make cost analysis tests, (2) correct abrasive or diamond blade for each material, (3) how blades cut, (4) when to use an abrasive blade and when to use a diamond blade, (5) how many cuts to expect from a blade, (6) how to tell if a blade is too hard or too soft for certain materials, and (7) how to make special or duplicates cuts with a diamond saw. *Eveready BrikSaw Co.*

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Reader Service (JULY/51)

AMERICAN FOUNDRYMAN

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CHAPTER ACTIVITIES

(Continued from Page 80)

who helped make his term a success and also extolled the work of the host chapter committees for the 55th Annual A.F.S. Convention.

Feature of the technical program was a showing of the A.F.S. sound-color research film, *"Fluid Flow in Transparent Molds—II."*

Chapter Membership Chairman Joseph Zahm announced that the Chapter's membership now exceeds the quota set by the National Office.

Publicity Chairman Marve Taublieb reported that management of the Statler Hotel, headquarters for the 1951 A.F.S. Convention, had praised the conduct of the Convention and its members and invited the Society to return to the hotel whenever it wishes.

Cincinnati Chapter foundrymen learned how it feels to lose their eyesight because of failure to observe optical safety practices in the foundry. Demonstration is part of "Let's Pretend" safety program developed by E. F. Chittenden and George Zang of Unitcast Corp., Toledo.

Chesapeake

William H. Baer
Naval Research Laboratory
Technical Secretary

May 25 meeting, held at the Engineers Club, Baltimore, featured two technical films.

William H. Johnson, Naval Research Laboratory, Washington, D. C., presented the film *"Step Gating,"* a sequel to *"Gating Systems for Metal Castings,"* in which it was shown that optimum quiet and sequence feeding can be attained by the use of reversed sprue step gate designs, which use momentum pressure traps to decrease the velocity of incoming metal.

The A.F.S. sound-color research film,

"Fluid Flow in Transparent Molds—II," emphasizes the need for good pouring practice, together with correct sprue runner design, so as to obtain smooth, non-turbulent flow, free of gas or dross entrapment. This flow was obtained by decreasing the volume of the runner as each ingate was passed, so as to maintain a full runner channel.

Tennessee

Carl A. Fischer, Jr.
Fischer Supply Co.
Chapter Reporter

APRIL 27 DINNER MEETING had as its speaker Zigmund Madacey, Caterpillar Tractor Co., Peoria, Ill., who discussed *"Core Making and Coreblowing."*

Mr. Madacey said that cores made in one piece cause much less trouble than cores made by pasting, hand ramming, etc. Blowing cores with very close tolerances is entirely possible with good core boxes properly vented, he said, and large production is not necessary to blow economically. Sand control is very important and moisture can not be under 1.8 or the sand will be dry, causing cores to lose shape, core box abrasion, sticking, etc. Moisture must be used in proper amounts, he added, and air conducted properly with vents, as the spray action of air pressure causes air pockets. Mr. Madacey said sand with moisture of about 2.2 can be used only with difficulty.

Engineering and pattern shops can be a great help to the coreroom by properly designing core blowers, he said, causing them to work more efficiently. Old boxes can be converted to core blowing, Mr. Madacey added, but it is best to use a properly designed new box. Start with a simple one and make corrections as they are needed, he said.

Mr. Madacey said that three billion dollars has been spent by the foundry industry to eliminate dust, noise, and improve working conditions and foundry products.

The speaker recommended concentrating on making quality castings, before turning to production problems.

A question and answer period was held after Mr. Madacey's talk.

Chairman's gavel changed hands at Tennessee Chapter's last meeting of the season as Retiring Chairman Paul Arnold, of United States Pipe & Foundry Co. handed it over to Incoming Chapter Chairman Porter Warner, Jr., (right) of Porter Warner Industries, Inc.

Photographed at Western New York Chapter's May 10 meeting by Chapter Photographer-Reporter Marve Taublieb, Frederic B. Stevens, Inc., were these new chapter officers and directors. Left to right, standing are: Treasurer Martin W. Pohlman, Pohlman Foundry, Inc.; Secretary Roger E. Walsh, Hickman, Williams & Co., Inc.; Director Joseph Zahm, Master Pneumatic Tool Co.; Chairman Erwin Deutschlander, Worthington Pump & Machinery Corp. Seated: Director William P. Quinn, Worthington Pump & Machinery Corp.; Vice-Chairman Carl A. Harmon, Hanna Furnace Corp.; Past Chairman A. A. Diebold, Bison Castings, Inc.; and Director Leonard Greenfield, Samuel Greenfield Co., Inc. Diebold continues as director.

Mr. Production is high man...

Illustration: Mr. George Garvey of City Pattern and Foundry, South Bend, Indiana observing the checking of an "ACCURATE" cope and drag set for an M. B. Skinner Co. 12" split coupling used for repairing broken cast iron mains.

WITH ACCURATE PRESSURE CAST COPE AND DRAG SETS

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Foundries everywhere are looking for means to increase production and lower their costs. ACCURATE cope and drag sets have helped to solve this problem for hundreds of the leading foundries from coast to coast.

ACCURATE cope and drag sets have clean smooth partings and patterns as cast, are straightened, and have alignment points. This will substantially reduce your finishing costs.

Maximum over-all plate dimensions for cope and drag sets are 54" x 64" and 48" x 80".

Why not use this profit making idea in your foundry? Write for catalog No. 515.

ACCURATE MATCH PLATE COMPANY
1847 WEST CARROLL AVENUE CHICAGO 12, ILLINOIS
Telephone SEeley 3-7918

NEW PRODUCTS

(Continued from Page 81)

FOR FURTHER INFORMATION ON NEW FOUNDRY PRODUCTS LISTED HERE USE CONVENIENT POSTCARD ON PAGE 81.

resistance to tearing caused by tractive pull of heavy loads. Manufacturer claims Emeri-Crete flooring actually improves with wear as emery particles are exposed. Flooring retains its non-skid surface permanently and permits quick stops and starts of power trucks. Permanent smoothness reduces wear and tear on handling equipment. Ordinary floor laying techniques are used. *Walter Maguire Co.*

Heavy Duty Air Vibrators

13—Series 80 vibrators are designed for a wide range of materials handling applications and can be mounted parallel to the longitudinal direction of material flow to insure positive "in line" transmission of sand, coal, ore, slag, chips and other powdered or granular materials. Unit can be operated in horizontal or vertical position with equal efficiency and can be used on chutes, benches, screens, tables, conveyors, foundry shakeouts, molding machines, etc. Units operate on 80 psi line pressure, incorporate 5/8-in. mounting bolt holes set on 4-in. centers, weight 21 lb, and can take either 1/8 or 1/4 in. brass or steel straight or ell-type hose fitting. *Spo, Incorporated.*

Powder Washer for Castings

14—Powder-Washing Process utilizes special blowpipe equipped with external attachment to remove sand encrustations, fins, pads, chaplets, chill nails and other excess metal from castings quickly and easily. Iron-rich powder is fed through oxy-acetylene preheat flames into low-velocity oxygen stream, where it burns

and produces superheated liquid iron oxide. Heat from combustion of powder and from slag simplifies and speeds removal of metal and metal-sand mixtures. Wherever powder-fed flame is directed against a casting, metal surface is brought quickly to kindling temperature and is oxidized and blown away by the oxygen stream. After Powder-Washing, surfaces of castings are left smooth, clean and to close tolerance. There is no undercutting, no torn metal. *Linde Air Products Co., A Division of Union Carbide & Carbon Corp.*

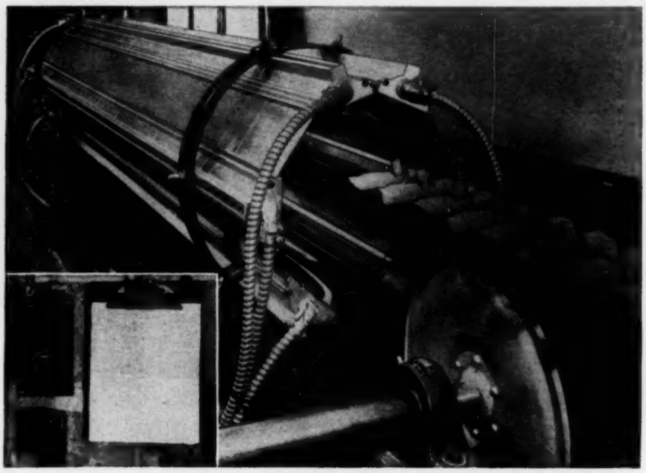
Break-Resistant Blade

15—Clipper Break-Resistant Abrasive saw blade for masonry cutting cannot be damaged by dropping, twisting in the cut or bending, according to manufacturer. Made from layers of glass fiber cloth impregnated with resins and silicon carbide pressed hydraulically and processed in kilns, blades are especially effective in cutting dry press refractories, concrete products, limestone, sandstone, transite, etc.

Manufacturer recommends blades for hand power tools where it is impossible to maintain true cutting level. *Clipper Mfg. Co.*

Brinell Hardness Tester

16—Incorporating a throat depth of 24 in., Brinell Hardness Testing Machine is hydraulically operated and adaptable to production of armor plate and other manufacturing processes requiring a deep-



Six Chromalox 3 kw. all-metal Electric Radiant Heaters making up this 6 ft. aluminum tunnel oven, provide wide-band infrared heat for uniform drying of sand cores used in manufacture of plumbing fixtures. Oven has quick warm-up, closely controlled, easily duplicated heat for any core size. Inset shown is input controller and production chart for recording time and temperature.

Electric Sand Core Oven Triples Drying Capacity

Milwaukee, Wisconsin—A unique, all metal infrared tunnel oven has tripled capacity for drying wash-dipped sand cores of a local manufacturer of brass plumbing fixtures. It also takes less floor space than the fuel-fired oven it replaced; has reduced handling, minimized breakage, and lowered operating costs.

The oven consists of a 6 ft. aluminum tunnel, 11″ in diameter, with six Chromalox 3 kw., rod-type electric radiant heaters clamped to circular shaped angle iron. Heaters radiate long wave length, unfiltered infrared heat that is absorbed with almost equal speed by all colors and surfaces; have 30-second percentage timers to closely control temperature and on-off heat cycles, and prevent burned or damp cores; provide oven temperatures up to 450°. Tunnel dries wash in two minutes; old oven required 10 to 15 minutes drying time. New oven can be turned off when not in use and brought up to temperature again in two minutes. Old oven required an hour warm-up. This latter difference alone reduced operating costs by $1.25 a day.

Cores are set on conveyor as dipped, carried through tunnel at 6 fpm, and conveyed 11′ beyond tunnel exit, where they are cool enough to handle. They were racked after dipping under old system, and dried in batches: by time rack was filled, wash had soaked into some of cores, and crumbing occurred.

The new setup occupies only 45 square feet at end of room. Old oven required 100 square feet in room center.

MORE INFORMATION

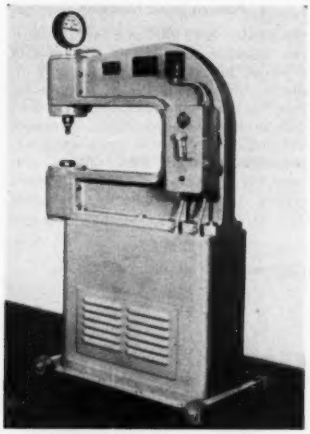
Further data on this and other efficient applications of Chromalox Electric Radiant Heaters is available without obligation by writing: EDWIN L. WIEGAND COMPANY, 7609 Thomas Blvd., Pittsburgh 8, Pa.

SB-24

CHROMALOX

Electric heat for modern industry

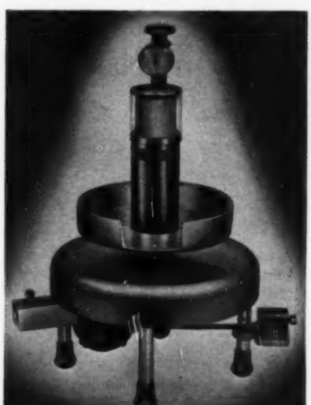
throated machine. Model AP-1 incorporates such features as: (1) mounted on wheels for rolling out way when not in use, and then rolling back into position over conveyor, (2) lower anvil is top of hydraulic piston which rises as load is applied to take pressure off conveyor and



keep work level as test is made, and (3) machines are custom-made to conform to customer's conveyor height. Operating cycle is controlled by snap switch and hydraulic unit is located in base supporting C frame. Overall dimensions are 41-in. deep by 19-in. wide. *Steel City Testing Machines, Inc.*

Green Core Impact Tester

17—Ability of a green core to resist slumping and cracking is readily shown by a practical new No. 621 green core impact tester, designed for use where strength tests alone fail to insure proper sand performance under usual core



room conditions. Unit is motorized and equipped with a jolt counter to reduce time and effort. Entire machine is finished in enamel. *Harry W. Dietert Co.*

(Continued on Following Page)

NEW PRODUCTS

(Continued from Page 87)

FOR FURTHER INFORMATION ON NEW FOUNDRY PRODUCTS LISTED HERE USE CONVENIENT POSTCARD ON PAGE 81.

General Purpose Pyrometer

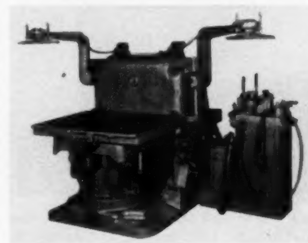
18—General-purpose, low-temperature portable pyrometer, the Type LT-840 Xactemp, is a self-contained instrument for rapid temperature determination below 800 F. Precision built, meter features metal case with double-strength glass window, easy grip handle for convenient use in any position, and choice of four calibrations for most effective use of scale range. Available for use with instrument are two needle thermocouples, surface tip thermocouple, and other thermocouples and extensions arms that are easily interchangeable. *Claud S. Gordon Co.*

Impact Wrench

19—Portable electric impact wrench applies and removes screws, studs and nuts. Model 2EW will also drill, tap, ream and extract broken capscrews or studs, drive wood augers, hole saws and wire brushes. Designed for easy one-hand operation, this 11-in., 7-lb unit is particularly good for use in close quarters. Pistol grip and trigger switch allow better control and instant response. Unit is powered by reversible, air-cooled universal motor for operation on 115-volt, a-c, d-c current. Model for 230 volts is also available. Impact hammer is mounted on anti-friction bearing to eliminate kick and twist. *Mall Tool.*

Pattern Draw Machine

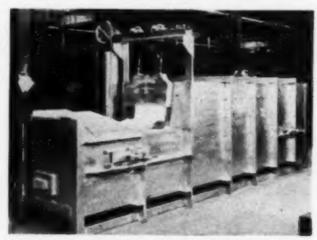
20—Model 507 jolt rock-over pattern draw machine has 1500-lb jolt capacity on 80 psi line pressure and 10 to 20-in. pattern draw stroke. Design features include "inverted jolt" mechanism, automatically-locking rock-over table, one-piece steel rock-over table, and quick-acting air-operated diaphragm flask clamps. Machine has centralized controls, air-locked leveling bars, automatically controlled valve to govern rock-over operation and



adjustable slow and fast speeds that remain constant after being set. Machine can handle flasks of any length and up to 32-in. wide. Maximum flask space is 24 in. and minimum 16 in. Unit is equipped with automatic air line lubricator, lubrication fittings and two air vibrators. *Spo, Inc.*

Continuous Heat Treating Furnace

21—Continuous electric furnace for production heat treating has belt entirely enclosed within heating zone to reduce



heat loss and operating cost. Either water or oil may be used as quenching agent. Production is 800 lb per hr. *Bellevue Industrial Furnace Co.*

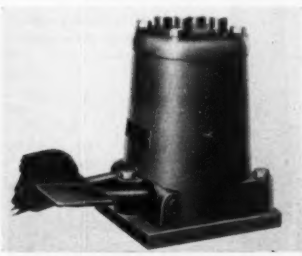
Bandsaws

22—Three new 15-in. bandsaw models provide speed ranges from 80 to 5000 fpm by simple turn of a handcrank. There are no belts to change, no gears to shift, and eye-level indicator shows blade speed at a glance. Blade tracking arrangement utilizes large yoke which places the pivot point at the crown of the upper band

wheel, thus holding crown in perfect alignment with bottom wheel at all times. Hard cast bronze guides provide rigid alignment of flat blades and are adjustable fore and aft as well as sideways. Upper band wheel assembly is mounted on rigid steel tube and is adjustable vertically 4 in. to provide 8-in. blade take-up. Table measures 16½ x 17 in., is of precision-ground cast iron box construction, and tilts 45 degrees right and 5 degrees left. Guides are supplied with each machine to provide easy changeover for use of either Tyler Spyral or flat blades. *Tyler Mfg. Co.*

Foot Operated Air Valve

23—Quick-As-Wink foot operated valves permit hammers, shears, presses, hopper gates, furnace doors and all other types of air operated machinery and



equipment to be controlled by foot pressure on a pedal, leaving both of operator's hands free. Valving mechanism has stainless steel body and push-pull rods, brass sleeves, self-sealing U-shaped packers. All operating parts are fully enclosed and protected with cast iron housing. There is no metal-to-metal seating and all parts are in pressure balance, eliminating creeping and crawling. Pipe connections are conveniently located through top of housing. Sizes range from ⅜ to 1 in., with 3-way, 4-way, neutral position and regular actions. Single and two-pedal designs for air to 150 psi and 150 F. Descriptive catalog available. *C. B. Hunt & Sons, Inc.*

Oscillating Trough Conveyor

24—Designed to handle a great variety of loose bulk materials at moderate capacities, the Flexmount Oscillating Trough Conveyor handles hot, sharp, jagged material where oiliness or corrosion is a hazard, with virtually no wear of metal troughing. Escape of dust or gases can be handled by addition of metal cover with flexible connections at loading or discharge points. Flexmount is a one-piece metal trough with high sides, supported on simple, one-piece flexible members which function as springs. Trough is normally 4-in. deep and can be furnished in standard widths of 8 to 24 in., made of No. 10 or 12 gage steel, stainless or corrosion-resistant steel, or other special metal. Motion is imparted to trough by a constant-stroke eccentric roller bearing. Troughs in lengths up to 100 ft can be furnished. *Link-Belt Co.*

PERSONALITIES

(Continued from Page 67)

Hyman Bornstein, Deere & Co., Moline, Ill., past National President of A.F.S., on June 19 was one of 10 men honored by the American Society for Testing Materials with its 1951 Award of Merit. The award was made at a luncheon meeting during the Society's Annual Meeting, held at Chalfonte Haddon Hall, Atlantic City, N. J.

Herbert J. Cooper heads a group of three executives of Cooper Alloy Foundry Co., Hillside, N. J., promoted to new positions. Mr. Cooper, who was formerly assistant general manager, has been named general manager and will be in charge of all foundry, machine shop and pattern shop activities. A graduate of the Columbia University School of Metallurgy, he was until recently engaged in practical research in the development of centrifugal casting and oxygen injection techniques.

Albert G. Lauzon has been named president; **Hal O. Gummere,** vice-president and general manager; **Ervin Reeves,** treasurer; and **Earl Hamilton,** secretary of Buckeye Tools Corporation, Dayton, Ohio. Other executive appointments announced by the company's Board of Directors are those of **E. B. Meynard** to sales manager and **Dave Thomas** to plant superintendent.

Richard F. Carroll has been named head of budget and material control, and **J. William Schaeffer** head of the company's standards section for Hunt-Spiller Mfg. Corp., Boston.

George J. Goepfert has been named director of research for both the Speer Carbon Co. and the International Graphite & Electrode Corp. Holder of a D. Sc. in chemistry from Fordham University, Dr. Goepfert was formerly supervising engineer of Carborundum Co.'s research and development division, Niagara Falls, N. Y.

OBITUARIES

Dilwyn S. Stevenson, purchasing agent for the United States Pipe & Foundry Co., Burlington, N. J., died May 16 following a brief illness. Mr. Stevenson began as an employee of the company's purchasing department and after a series of promotions was named purchasing agent in 1943.

Cecil E. Bales, president of the Ironton Fire Brick Co., Ironton, Ohio, died May 26 at the age of 53. Mr. Bales, who had been a member of A. F. S. since 1922, was a past president of the American Ceramics Society, a director of the American Refractories Institute and twice president of the Ohio Ceramic Industries Association. After attending the University of Chicago and the University of Kentucky, Mr. Bales became chief chemist for the Louisville Fire Brick Works, remaining with that organization until 1926, when he joined Ironton as production manager. He was named vice-president of the company in 1929 and president in 1950.

ABSTRACTS

Abstracts below have been prepared by RESEARCH INFORMATION SERVICE of The John Crerar Library from current American and foreign literature. For literature searches and translations of technical, industrial, and scientific literature, and photostats and microfilm, write to: Research Information Service, The John Crerar Library, 86 East Randolph Street, Chicago 1, Illinois. Rates for above services given on request.

Aluminum Alloys

A125—American and European Names. W.G.R. De Jager, "The Nomenclature of Aluminum," *Metalen*, vol. 6, March 15, 1951, pp. 69-76. (In Dutch)

This article lists the designations used for various aluminum alloys in the following countries, the chemical composition being specified for each alloy: Holland (trade names of Ned. Aluminium Mij (Nedal)), United States (Alcoa trade names, ASTM standards), Germany standards (DIN 1712, DIN 1720, trade names of various companies), Great Britain standards (BS 1470 (1948), trade names of various companies), France (standards NFA 57-312, NAF 57-502, trade names of various companies), and Switzerland (designations of the Verein Schweizerischer Maschinenindustrieller, of the Aluminium-Industrie Aktien-Gesellschaft, and the trade names of various other companies).

X-Ray Light Metal Castings

A126—Examine Section up to ½-in. Justin G. Scheeman and T. E. Piper, "Fluoroscopic Inspection of Light Metal Alloys," *Non-Destructive Testing*, vol. 9, Winter Number, 1951, pp. 20-22.

This is a description of the method, apparatus, appropriate safety measures, and possible applications of non-destructive testing by means of fluoroscopic x-ray inspection. The method was found to be sufficiently accurate to eliminate light metal alloy castings with rejectable defects in accordance with the present standards of acceptance by the major aircraft companies. By way of example, the authors state that with x-rays at approximately 100 KV and 10 milliamperes, with a source to screen distance not exceeding 20 in., aluminum and magnesium castings can be successfully fluoroscoped provided the cross sections to be examined are not larger than ½-in.

Review French Foundry Practice

A127—Defect Due to Metal. Albert Portevin, "Definition and Classification of Casting Faults With a Metallurgical Origin," *Fonderie*, no. 62, 1951, pp. 2345-2357.

This is a review article, originally presented in the form of a report to the Association Technique de Fonderie, on the various kinds of casting faults that may occur. The author lists the underlying physical phenomena, characteristics of the faults, and means for their prevention or

(Continued on Page 94)

FOUNDRY FIRM *Facts*

Admiral Die Casting Corp., a newly-organized firm, announces completion of a modern plant at 200 West 83rd St., Chicago. The plant is equipped with latest-type high-pressure machines for aluminum, zinc and magnesium die casting. Machining, cleaning, painting and engineering departments are included in the company's blue-print-to-finished-parts setup.

Stockham Valves & Fittings, Inc., Birmingham, Ala., announces installation of a new 36-in. hot casting conveyor in its malleable foundry, whose Unit 2 can now operate for 45 minutes without lost time in case of a cleaning room breakdown. Also newly-installed are several hoods and ventilator fans.

Chemical Div., Borden Co., plans to construct a formaldehyde and liquid urea resin manufacturing plant on the outskirts of Demopolis, Ala.—the first such plant in the Southeast. Construction of an outdoor distillation plant, which will cover about five of the 20 acres acquired for the project, will begin shortly and is expected to be completed early in 1952. The new unit will act as a feeder for the company's Kernersville, N. C., operation and will be geared to produce about 1½ million lb of formaldehyde and about 2 million lb of liquid urea resin, which is used for foundry core binders, monthly.

General Electric X-Ray Corp., Milwaukee, manufacturing affiliate of General Electric Co., became a department of the parent organization on June 30. G-E X-Ray President John H. Smith will become general manager of the new department. The X-Ray department will be part of the Apparatus group, one of the three main operating groups of G-E, and has been assigned responsibility for producing and marketing synchrotrons and betatrons.

Harbison-Walker Refractories Co. announces construction of a new refractories plant at Windham, Ohio, and plans for a similar plant at Fairfield, Ala. The Windham project includes complete facilities for the manufacture of silica brick, a high-temperature refractory used in repairing foundry and steel mill furnaces and by-product coke ovens. Brick will be fired in tunnel kilns 550 ft long, with fuel oil or natural gas. The main building will be 1090 ft long and 200 ft wide. Sharon conglomerate pebble rock, a main brick ingredient, will be brought by truck from the company's quarry at Garrettsville, Ohio, six miles away. Construction is expected to be completed this year.

Read Standard Corp. is the new name of **Standard Stoker Co.**, Erie, Pa. Facilities, on Page 28, wrote on gating aluminum company address, and personnel remain unchanged.

Eastern Clay Products, Inc., is opening a second plant at Jackson, Ohio, for the production of Cupoline patching refractories, used mainly in the company's Bondactor machine for mechanical patching and lining of cupolas and ladles. Plant No. 1 will be used to produce Cupoline products as well as the company's older line of foundry sands and clays. The new plant is expected to insure against interruption of production and to double output of existing facilities.

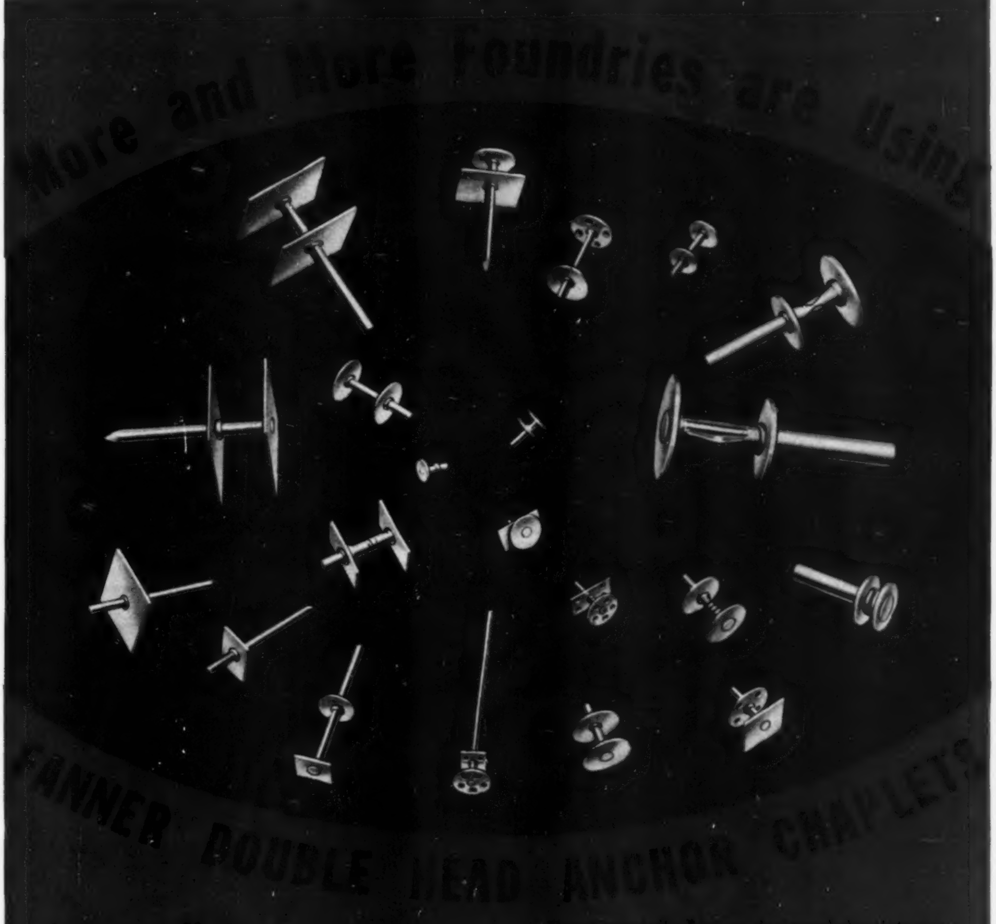
United States Radiator Corp., Detroit, has been given the Merit Award of the American Society of Industrial Engineers "for leadership in research, engineering, design-styling and manufacture in the boiler and radiator field." The award was made by ASIE President Robert L. Crinnian to President Wesley J. Peoples of U. S. Radiator at the 69th Convention of the Association of Master Plumbers, held at Navy Pier, Chicago.

Eutectic Welding Alloys Corp. is constructing a modern administration building adjoining its Flushing, N. Y., plant which will house in addition to its general and executive offices the new Eutectic Welding Institute. More than 200 persons, including prominent civic and industrial figures, attended the building's dedication ceremonies on May 18.

Saginaw Malleable Plant Visit Highlights Chapter Education Series

Feature of A.F.S. Saginaw Valley Chapter's series of four educational meetings for high school students of the chapter area was a visit to the Saginaw Malleable Iron Foundry, where nearly 200 students witnessed the various phases of foundry operation. Other meetings in the series included a lecture demonstration by Donald Judge, Hamilton Foundry & Machine Co., Hamilton, Ohio, on casting fundamentals; a talk by Ralph Lee of General Motors Corp. on "Gittin' Bit by the Foundry Bug": and a question and answer session on March 29, with local high school students doing the questioning and Saginaw Malleable experts answering them.

IT'S FANNER for CHAPLETS



Important Notice:

Two motion picture films—one on the use of [illegible], the other on the use of Chills—are available, free of charge, for showing at Foreman Club meetings, in technical schools, A. F. S. chapter meetings, etc. Write for reservation.

These specially Fanner designed chaplets are rapidly replacing other types of chaplets in foundries the country over . . . BECAUSE THEY ADD EXTRA ASSURANCE OF PRECISION CASTING.

The reason is the extended stem which serves as a definite anchor in holding the chaplet in place, keeps it from being washed away in the molten metal.

Available in tinned or coppered finish. When ordering from your jobber, always insist on Fanner chaplets.

THE FANNER MFG. CO., CLEVELAND 1, OHIO

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ABSTRACTS

(Continued from Page 91)

repair. Extensive illustrative material, consisting of diagrams and photographs, is drawn mainly from French practice.

Steel Sands Reclaimed

A128—Conditioning Methods. K. Roesch, "The Dressing and Recovery of Molding Sand, Especially for Steel Casting," Giesserei, vol. 38, April 1951, pp. 145-149.

The author discusses the physical and chemical changes which molding sand undergoes during the casting process, in order to point the way toward methods making possible recovery of the sand. The sand is strongly influenced by the strong heating and the chemical reaction of the sand surface with steel. Iron silicates are formed, the clay is partially overburned and the quartz grains are splintered. By means of air sifting, and wet or hot dressing, the sand can be put in condition for another steel casting process. (in German)

Swedish Cupolas

A129—Patching Practice. Erik O. Lissell, "Cupola Refractories," *Gjuteriet,* vol. 41, 1951, pp. 35-43.

The growth of the Swedish gray iron foundry industry in recent years has forced the foundries to run cupolas for a longer time per heat than previously. Refractory problems have thus become more prevalent. The author discusses the attack of fuel, metal and slag on the various parts of the furnace. In this connection the choice of refractory is dealt with. Special attention is given to the combustion zone where the burn-out is most severe. Factors governing the degree and shape of burn-out are discussed, and suggestions given for minimizing the erosion. Contour and straight patches are compared. The composition and properties of patching materials are dealt with from theoretical and practical points of view. Composition and grading of various ganisters are given as well as some general suggestions regarding composition, mixing and daubing. (in Swedish)

Oil Core Binders

A130—Factors Affecting Properties. D. T. Kershaw, "Experimental Work on Oil-Sand Practice," *Foundry Trade Journal,* vol. 90, No. 1796, Feb. 1, 1951, pp. 115-122.

A report on studies of basic properties of core binders carried out in a machine tool foundry. The author discusses and shows graphs of the effect of moisture, binders, baking time and temperature, type of sand, and ammonium nitrate on core properties. Ammonium nitrate (1 per cent) is added to increase bench life and in addition results in higher baked strength and faster baking. Lower strength, increased gas evolution, and decreased permeability are cited as disadvantages in the use of recovered core sand. Compressive strength of baked cores, the author found, increased from 250 to 800 psi as the temperature of testing decreased from about 400 F to room temperature.

CHAPTER OFFICERS

(Continued from Page 26)

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A.F.S. Publications

A. F. S. Employment Service

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Applicants for jobs must send an outline of their experience and background for transmittal to prospective employers.

HELP WANTED

HW566—Chief Inspector: in malleable foundry in Midwest. Must be capable of layout work and have some experience in malleable work. Please state age, experience and salary expected in reply.

HW568—Die Cast Die Designer or Permanent Mold Designer. Light metals experience required. This is a permanent job with unlimited future for qualified man. Position is in modern Midwest foundry facility now undergoing expansion. Salary commensurate with ability. Bonus plan. Send complete resumé.

HW569—Foundry Superintendent: for shop producing 500 tons carbon and alloy steel, 300 tons electric iron and 150 tons brass pressure vessel castings per month. Must have broad and extensive experience in foundry operations, proven administrative ability and good practical and technical background. Excellent opportunity with long-established company of best reputation. Reply in confidence giving full information as to age, background and experience as well as salary requirements.

POSITIONS WANTED

PW159—Foundry Manager or Superintendent. Age 41 with 25 years' experience in well-known machine tool foundries. Successful in installing quality control, building teamwork, cutting costs and showing a profit.

PW160—Metallurgist. B. S. in Met. Eng. Two years' experience covering acid electric steel and gray iron control; sand, metallurgical and chemical laboratory supervision. Desires responsible position with a future.

PW161—Pattern Technician: wants position with manufacturing firm as pattern technician and casting expeditor. Have thorough knowledge and background in foundry technique and latest pattern and core box designs. Able to diagnose and remedy trouble. Capable of supervising entire pattern and casting activity. Age 44. Married. Responsible.

New England Founders Hear Bruce Old

APRIL 11 MEETING of the New England Foundrymen's Association, held at the Boston Engineers Club, featured a talk on new developments in blast furnace operation by Dr. Bruce S. Old of Arthur B. Little, Inc., Cambridge, Mass.

Blast furnaces have changed little throughout the ages except in size, Dr. Old said, until recently, when such improvements as use of hot instead of cold gases, increased top pressures and jet tapping have been introduced.

President Robert Walker presided over a brief business meeting and welcomed new membership of the Leonard & Baker Stove Co. (Welch Industries).

LINOIL

The tailor-made, all-purpose core oil — available in various grades to meet any core room situation. More than a half million gallons of Linoil are used monthly by foundries all over the United States and in Canada. Linoil has been known for uniform quality for over 30 years... is accepted as a standard in the industry by the nation's leading foundrymen.

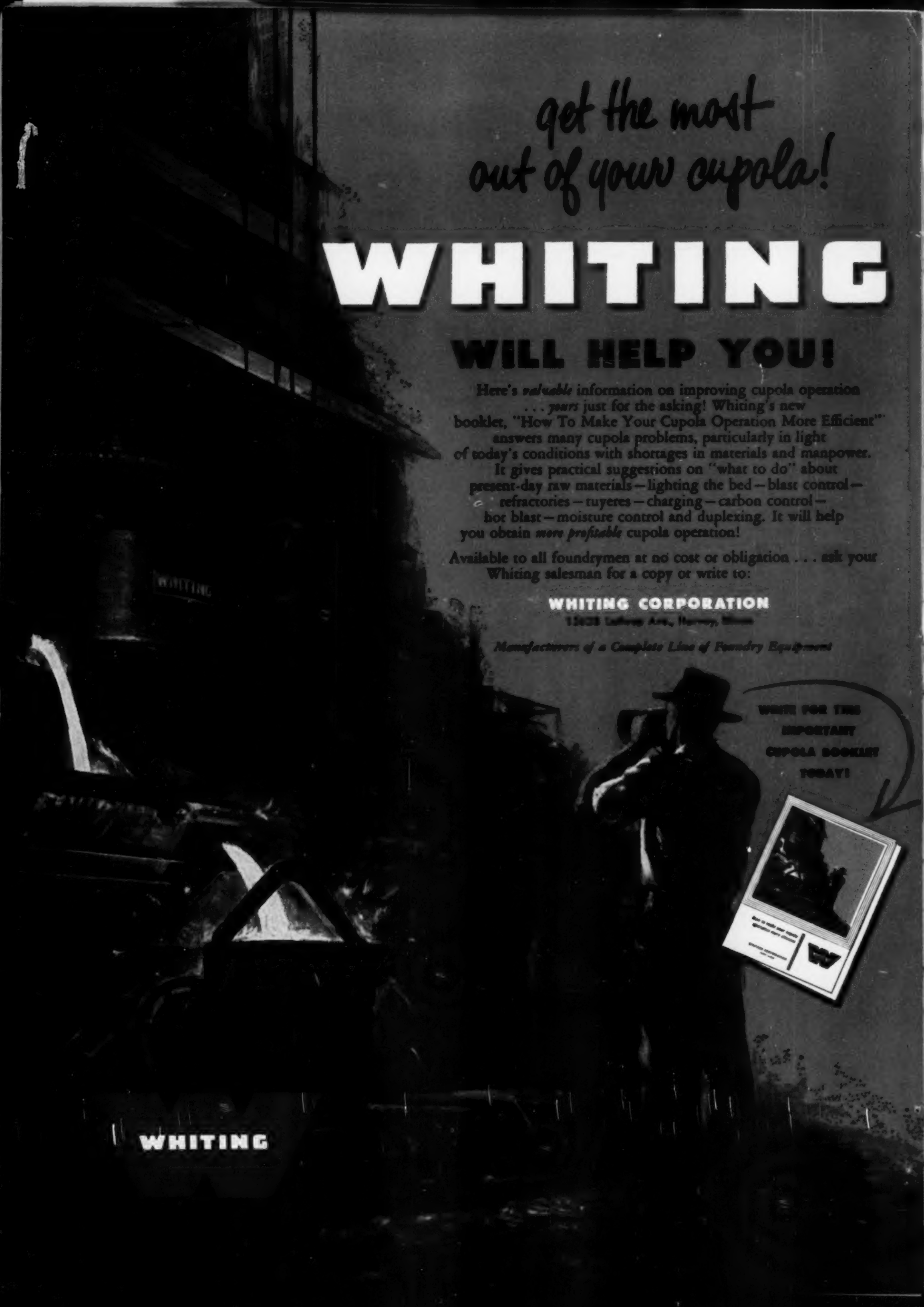
INDUCTOL

The newcomer in core oils — developed in ADM's Research Laboratory principally to increase core baking efficiency through faster baking and resistance to overbaking. Foundries using Inductol report up to 50% increase in oven capacity. Inductol has excellent collapsibility — burns away rapidly at temperatures above 800°F. — a particularly desirable characteristic in magnesium, aluminum and malleable iron casting.

LINOIL-INDUCTOL COMBINATIONS PAY OFF

Many foundries benefit by using both Linoil and Inductol... Linoil, for general, all purpose core room use—Inductol, where faster baking is required or greater oven capacity is needed.

Call on your Linoil man for advice. If you have a core room problem, use ADM's Research Laboratory — it's a *Free Service.*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Here's *valuable* information on improving cupola operation . . . *yours* just for the asking! Whiting's new booklet, "How To Make Your Cupola Operation More Efficient" answers many cupola problems, particularly in light of today's conditions with shortages in materials and manpower. It gives practical suggestions on "what to do" about present-day raw materials—lighting the bed—blast control—refractories—tuyeres—charging—carbon control—hot blast—moisture control and duplexing. It will help you obtain *more profitable* cupola operation!
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